

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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Henry Disston.

The announcement of the death of Henry Disston, of Philadelphia, which occurred at his residence in that city on the 16th inst., was received with profound regret by all who appreciate sterling worth and successful enterprise, and with keen sorrow by a very large circle of personal friends and business acquaintances. Probably no American manufacturer was better or more favorably known at home and abroad than Henry Disston, and none can claim to have done more to establish American industry on a broad and substantial basis than this industrious, energetic mechanic, who, in the face of difficulties so great that they would have discouraged ordinary men, attained a success for which it would be difficult to find a parallel.

Henry Disston was born in Tewkesbury, England, in 1819, and remained at home until 13 years of age, when he emigrated to America with his father, who died three days after their arrival in Philadelphia. Thus left to himself, the young man adopted the best course to insure success in life, and decided to learn a trade. Seizing the first opportunity, he bound himself as an apprentice to a saw maker. He served his employer faithfully, and when his time was out had enough saved from his earnings to begin business for himself in a small way, in a cellar near the corner of Arch and Second streets. He did all his own work, wheeling the first barrow-load of coal from Willow street wharf to his shop. The manufacture of hand saws had already been attempted by other makers, but with indifferent success, and it seemed to have been reserved for Mr. Disston to establish that important and useful branch of industry on a firm and enduring basis in this country. But this was not accomplished without many severe trials and struggles.

In order to prove to merchants that he was determined to compete with foreign makers, Mr. Disston was frequently compelled to sell his saws at an advance of only one per cent. over the cost of production; but their excellence gave them a wide reputation, and in the year 1846 he removed his small establishment and rented a room in the factory of Mr. William Miles, then situated on a part of the site of the present works, at Front and Laurel streets. In 1849 he was burned out, and this event caused him to take up a lot adjoining, 60 by 150 feet, on which, in the space of 10 days, his first factory, 30 by 60 feet, and four stories high, was erected, and formed the nucleus of the present extensive and famous establishment. Since that time the business has grown steadily and rapidly. Before the war it was customary for American saw makers not only to depend upon English sources of supply in steel, but to return to England the scrap for remanufacture. Mr. Disston, however, soon recognized the needlessness of this, and about 20 years ago he decided to manufacture his scrap into billets and roll therefrom the saw plates. This was attended with great profit during the war, and he soon extended his business to include the production of cast steel. The works on Laurel street, Philadelphia, where the steel is made, and the steel parts of tools are formed, cover eight acres of ground, and are filled with machinery for perfecting the processes of manufacture and reducing cost. Mr. Disston's inventive skill and knowledge of what was needed, enabled him to devise or introduce many new forms of teeth for saws, designed for special kinds of work, and "combination tools," which are so useful that they find a ready sale, particularly in new countries.

In considering the nature and conditions of Mr. Disston's business success, it is well to remember, what is now nearly forgotten, that the prejudice of American consumers in favor of English steel was so great as to place many obstacles in the way of success in its production. The prejudice against domestic steel as a material for saws was especially strong, and notwithstanding the well-known and admitted excellence of his saws, Mr. Disston was for several years compelled to conceal the fact that he made them from steel of his own manufacture; and it was not until the good quality of American steel was established beyond question that the fact became known.

In connection with saws the firm of Henry Disston & Sons undertook the manufacture of various specialties in the way of cutting tools and steel implements, such as cane knives, trowels, moulding tools, &c. At Tacony there are branch works, where files, both machine and hand-cut, and the brass-work and woodwork for the other tools are manufactured. The file works were established originally to supply the saw works with files, but a demand soon sprang up for them, and large quantities are now made for the general market. The variety of the manufactures enabled the firm to make one of the finest and most valuable displays of steel tools in the Centennial Exhibition. The magnitude of the works is shown by the fact that in 1876 there were 1200 men employed, and the saw works alone were capable of making five tons of saws per day.

Mr. Disston was gifted with a natural mechanical genius, and during his long and busy life he invented and adapted many valuable improvements which have done much to make a reputation for American tools. He had the faculty of observing wherein a familiar tool or implement or machine was defective; the genius to devise

the means to improve it, and the handcraft skill to do the manual work necessary to carry his own device into effect. He had other qualities quite as essential to the great mechanic. He was industrious, hopeful and persevering; confident that superiority of workmanship must win success; satisfied that he could turn out superior work, and resolute in the endeavor to make his tools the best of their kind. He had one other priceless quality: he was not above doing with his own hands any of the labor incident to his trade. There were no mysteries involved in Mr. Disston's success. He worked his own way through and out of difficulties and discouragements, developed to the fullest extent his opportunities, and pushed steadily forward with but one ambition in life—a great, permanent and honorable success in his business. To him everything else was secondary to this. It is doubtful if he ever sought or expected wealth until it came to him naturally as an incident of

supervision of the establishment, is a saw maker by trade, having served a regular apprenticeship to the business and worked his way up to his present position from the anvil. We are able to say from personal knowledge that this gentleman is thoroughly familiar with every detail of the great business established by his father, and that with the aid of his brothers, Messrs. Albert H. and Horace C. Disston, partners, and later of Mr. William Disston, now learning the trade, he will conduct it in the progressive and skillful manner which has characterized its management during the past 30 years. We have reason to know that the pride of name is strong in these gentlemen, and that the world-wide reputation of the father will be jealously guarded by the sons.

The Bankrupt Law.

The Pittsburgh Leader publishes the following article upon the action of the bank-

ruptcy law. As a result the bankrupt courts have a steadily increasing business, and men discover the weak points of the law and learn to take advantage of them.

The demoralizing effect of these frequent "failures"—a thing that not long since looked upon as neighbor to a crime—could not, a few years back, have been estimated, but which is now recognized as liable to assume any proportions and shake the whole basis of business credit; and although the dishonesty of many of the cases is so apparent as to throw a doubt upon all others, yet the story is so oft repeated that men have ceased to speculate upon it, and gradually come to recognize in it a custom to be adopted at any time that money can be made or saved by so doing.

Men who a few years previous would have scouted the idea of taking advantage of the bankrupt law until forced to do so, will, when circumstances crowd them a little, gradually come to see less and less objection

for a friend, who shortly failed. The man at once repaired to the bank and stated that it would be impossible for him to meet the paper; that he had put his name to it without the least idea of having to pay it himself, and that it was out of the question for him to do so. The bank replied, of course, that it was in consideration of his name that the money had been advanced, and it would expect him to fulfill the obligation, as it was known he was fully able to do so. Upon all offers of compromise being refused, the man deliberately set about disposing of all attachable property, sold his interest in business to his partners, put heavy mortgages on his real estate, and by the time the paper came due he had everything beyond the reach of attachment, and went through the prescribed course of bankruptcy as serenely as a summer morning.

Besides the class of bankrupts who are forced there by creditors and those who file petitions voluntarily, either through a real pressure of circumstances or desire to escape such condition by saving for themselves a nice, large portion of this world's goods—property belonging to their creditors—there is a large class of people who, it seems, have regularly embarked in the bankruptcy business, and have negotiations always on the carpet either for going into business or "compromising" with creditors, and the wonder still remains that these people ever have creditors; but it seems this peculiar class never has any trouble in that regard. From the rapid manner in which this class is growing in numbers, influence and opulence there seems to be millions in it. The method adopted is very simple, and only requires a small capital with which to indicate a large one and an easy assurance of bearing. Goods are usually bought at a distance, business is carried on as long as possible with the disbursement of as little money as possible further than is necessary to make appearance. When payment is insisted upon by the largest creditors and no more time can be gained by any possible manner, then a compromise is offered, and as the creditors are principally at a distance, and while there are a good many of them, their accounts not being large enough to warrant any additional expense in regard to what is at best uncertain, they generally accept. Should they force him into bankruptcy, our accomplished business man still remains master of the situation. He knows all the "short cuts," and while a non-professional would be still in the slough of despond he is smiling back at the susceptible drummer, making arrangements for a new stock; richer than he was, but not more ready to pay.

Not the least among the annoyances and loss to which the victims of the law are subject is the latitude given the receiver or assignee—positions that are generally filled by representative men who might be expected to settle the affairs intrusted to them with all possible dispatch; and yet the dilatoriness with which these matters are attended to has become proverbial. Instances have been given us where the assignees of large estates that went down in the grand crash of 1873 have not yet paid one cent against the estate, though handling \$50,000 and \$60,000 of its money, simply, as they say, "because the affairs are not yet fully settled up."

Another very unique instance will suffice just to index the variety possibilities of this law. The circumstances as they happened, as we are told, were in brief about as follows: A firm, consisting of a man and his nephew, were carrying on an extensive business when they became somewhat embarrassed. They at once decided to go into bankruptcy, but in order that the business might not be interrupted, and nothing lost that it was possible by good management to save, they decided to go through the mill one at a time. Accordingly the nephew transferred his share of the business to his partner, made safe disposition of his other effects, and upon the expiration of the six months, during which the law stipulates there shall be no transfers of property previous to filing the petition, the petition was filed, granted, and the young man permitted to pay a few cents on the dollar in order to balance his accounts with his creditors. Shortly after he had gotten safely through he was admitted again to his former business, his property was transferred back to him, and he and his uncle obtained a contract which netted them a large sum of money. The uncle then transferred all his property to the nephew, and at the expiration of the six months' limit he went into bankruptcy, got through by paying little or nothing, his property was transferred back to him by his nephew, and both are now comfortably fixed with no creditors to molest or make them afraid.

Each day of the brief existence of the present bankrupt law has shown its defects to have greatly the advantage of its capabilities for good. If the Legislature has any remedy for all this evil it certainly should apply it at once.

Ice did not become an article of commerce until the present century; but already in the United States alone \$30,000,000 are invested in the business of gathering and selling it. There has been a remarkable increase in the use of the article in the United States since 1845, when only 50,000 tons of it were used. In the year 1876 the consumers bought 2,500,000 tons, and probably 5,000,000 tons were cut. Beer brewers are the best customers of the ice companies, several using 30,000 tons annually.



HENRY DISSTON.

his business success; and when it came he knew how to employ it judiciously and liberally for his own good and the good of others.

Personally, Mr. Disston was a man to whom success would have been possible in any department of productive industry. Practical in all things and self-reliant, he also possessed exceptional executive ability, and surrounded himself with men calculated to fill subordinate positions to the best advantage. Hale, hearty and jovial, he was always popular, but no one thought of trifling with him or presuming upon his good nature. He exacted fidelity on the part of all who served him, but was so kind and considerate as an employer that every workman looked upon him as a personal friend. There are few large establishments in the country where a better feeling existed between master and men, or where less was thought or said about the conflict of capital and labor.

The forethought of Mr. Disston has been exhibited in many ways, and in nothing has this been shown more strongly than in the means which he adopted for the perpetuation of the business when he should no longer be able to give it his supervision. His sons have been educated with special reference to this end. Mr. Hamilton Disston, upon whom in late years has devolved the general

rupt law in that State. The evils complained of are not confined to any section of the country, and the remedies if found should be made of universal application:

It is understood that the Legislature will shortly be asked, in the shape of a bill to be introduced, to commence a general dissection of the bankrupt law for the purpose of correcting, if possible, its defects—for that its defects are many, there are numberless victims to testify. For the purpose for which it was framed perhaps the law has no fault; its defects lie in its susceptibility of imposture—the easy way it throws open for the shirking of honest debts.

A law that bears upon its face only the sign of mercy—shaped and framed for the ostensible purpose of befriending such as are overtaken by uncontrollable circumstances and weighted irretrievably by debt—it extends a helping hand and places the unfortunate beyond the reach of harassing creditors, free to recover his position and re-establish his credit when and how he can. But alas! "to what base uses," &c. That such a law should have become the bane of honest business men—the great rotten spot in business politics—is indeed a matter to be deplored, but it is none the less a fact. In its omission of leniency to the really unfortunate, there is no means of distinguishing and barring from its benefits the unprincipled and

to dropping into the ranks of honorable names who have been setting a continuous example to them. Thus the pernicious effects of a really good law reached not only to those who have no scruples about taking advantage of any means of making money, but its unhealthy influence is felt from pit to dome of society.

The interest awakened by the recent discussion of the subject by the Chamber of Commerce, and the proposed action of the Legislature, induced a *Leader* reporter to visit several bank officials and others, and ascertain exactly how the matter was looked upon. Said one: "The evil effects of the law are so many that I consider it one of the greatest curses of the community." Instances were given in numbers of its outrageous abuse, and in many cases by persons standing high in public opinion, and not materially lessened by the circumstance. So long, it seems, as the conditions of the law are fulfilled, the moral obligations do not appear to trouble many, and the even tenor of their way is scarcely interrupted. An instance, which was stated as common, was given by a prominent bank official of the ease with which a formerly respectable business man evaded the payment of an obligation that was made, of course, with full knowledge of the risk incurred. The person mentioned had indorsed largely on long paper

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Cash advances made on Iron.Report to Lloyd's on Steel for Boiler
Making.

Some time ago a committee of Lloyd's instructed Mr. Wm. Parker, their chief engineer surveyor, and Mr. Jas. Milton, their engineer surveyor, to report upon the question of applying steel to the construction of boilers. The results of their investigations are given in full below:

In accordance with the committee's desire that we should investigate the subject of the adaptability of steel for the purposes of marine boiler construction, we beg to report as follows:

In order to obtain as much information as possible regarding this material, we visited the steel manufacturing of Messrs. John Brown & Co. and Messrs. C. Cammell & Co., Sheffield, and of the Bolton Iron and Steel Company, Bolton, the engineering and steel works of the London and North-western Railway Company, at Crewe, where over 1000 locomotives had been constructed of steel, and the boiler-making establishments of Messrs. Hicks, Hargreaves and Co., Bolton, at which steel plates to the extent of from 5000 to 6000 tons have been employed in the construction of stationary boilers, and of Mr. T. Beeley, of Hyde Junction, who makes on an average about three boilers per week of this material. At each of these works we were received with the greatest courtesy, and every facility was afforded us of obtaining information on the subject of our inquiries.

The methods adopted in the manufacture of mild steel by the Bessemer and Siemens-Martin processes, which have already been fully reported upon, are such as practically insure the production of a material perfectly reliable, so far as regards its uniformity in tensile strengths, and its power to withstand certain bending tests. The limit of elasticity of this material bears about the same relation to its ultimate strength as in ordinary wrought iron, but the elongation or stretch under stresses proportional to the ultimate strengths is greater with steel than with iron, a fact which should not be lost sight of in forming an estimation of the strength of boilers. At first sight it recommends itself by its tensile strength, malleability and ductility, and also by its freedom from laminations and blisters as eminently suited for the construction not only of the shells and stays but also of the furnaces and combustion chambers of marine boilers. But while as a material it possesses in a special degree these high qualities, it is found that they become seriously impaired by its being subjected to the processes usually occurring in boiler making, and it is necessary to exercise the greatest care in the working of it to insure these qualities being retained in the structure, while, in some instances, it is even requisite to subsequently employ special means in order to restore them. The simple process of shearing affects to some extent the tensile strength of the plate operated upon, and a considerable portion of its strength is lost by punching. It is contended, however, and indeed it may be said to be placed beyond doubt, that the loss thus occasioned is fully recovered by the plates being annealed after they have been sheared or punched, and it is the practice at almost all the steel manufacturing works we have visited to anneal every plate after it is sheared and before being sent out of the works. We are also informed by Dr. C. W. Siemens, F. R. S., that at the Landore Steel Works every plate supplied for boiler making purposes is annealed after being sheared to size. It may be well here to remark that this annealing is not, as is frequently supposed, a process of some difficulty, requiring great care and considerable time in the operation. It consists simply of heating the plates to a low red heat—which allows the particles that have been strained or disturbed by the working of the material to resume their normal condition—and then cooling them uniformly.

Although in the course of our inquiries, our previous knowledge of the loss sustained in this material by punching and shearing was fully borne out, we find that considerable difference of opinion exists as to the exact amount of deterioration due to this cause; indeed we were unable to obtain from the manufacturers any really definite and reliable particulars on this point. It may therefore be interesting to mention the result of two of a series of experiments recently conducted on the Tyne, in connection with a steel boiler being constructed there under the inspection of the Society's engineer surveyors. These experiments, the results of which were communicated to the committee on the 10th December, 1877, and subsequently reported in detail by Mr. Manuel, were first made with plates eleven-sixteenths of an inch thick. The results were practically identical, the loss in each case being about one-third of the ultimate strength of the plates, and the material was observed to break with a granular fracture. But with the exception of the precise amount of strength lost, these tests did not disclose anything that was not previously well known, the fact of a considerable loss occurring in thick steel plates from punching having been frequently made public.

It was considered by all the steel manufacturers that this loss was due in some degree to the relative sizes of punch and die being badly proportioned, and it would appear that the relative proportions most suitable for iron plates would not be so for steel plates. The opinion was also expressed that if the holes were rimed out after punching, the destroyed part would be greatly, if not entirely removed. This view receives corroboration from the results of some experiments given in an interesting paper on the "Effects of Punching in Iron and Steel Plates," read by Mr. A. C. Kirk, of the firm of R. Napier & Sons, at the recent autumn session of the Institution of Naval Architects at Glasgow. With the view of obtaining more precise information regarding these questions, each of the manufacturers was kindly prepared a set of test pieces with holes drilled, punched, punched and rimed, and punched and annealed, the specimens representing the pitch and diameter occurring in practice in thick plates. We have also had prepared a number of test pieces of iron of the same thickness as the steel specimens, to be tested at the same time, to show the comparative results, which cannot fail to be of great interest and value.

At the engineering establishments visited by us, we had opportunities of seeing boilers in all stages of construction, and of witnessing the various operations of bending, flanging, punching, drilling, riveting and annealing. At some of these works the holes are drilled, and at others punched; but in all cases in which they are punched, the plates are afterwards annealed. It is the practice at all the works, and it is considered by these firms to be of the utmost importance, to perform the operation of flanging in only one heat if possible, and to have the plates uniformly heated throughout; but when this is not practicable and the operation is extended over several heats—the plates being heated locally piece by piece as is usually done in flanging iron plates—care is taken that the plates so flanged are afterward annealed.

The opinions of those who may be regarded as authorities on the matter differ greatly with regard to the limits of tensile strength which should be adopted for this material when intended for boiler making purposes. Mr. Beeley states that his experience leads him to insist upon no plates being supplied of a strength above 20 tons per square inch, while Mr. F. W. Webb, of Crewe, is in favor of rather higher limits than those now approved of by the committee. It is found, however, that steel with a strength of 26 tons per square inch will weld better and with more certainty than steel of a higher strength. Taking into consideration the fact that the milder material is more easily worked and less likely to be injured by careless manipulation than that of higher strength and more brittle nature, and that in the ordinary run of boiler yards there will be found neither the appliances nor the extreme attention paid to the work as at Crewe, we are of opinion that it would not be prudent, at least until further experience is gained, to raise the limits; while at the same time it might be advisable to recommend that plates used in the construction of the furnaces and combustion chambers be specified to withstand not more than from 26 to 28 tons per square inch.

With regard to the question of steel rivets, it has been conclusively shown by the results of some of the experiments made on the Tyne, that they may be used with as much reliability as steel plates, but that, like the latter, they require greater care and discrimination to be exercised in the working of them than those made of iron. In the opinion of Dr. Siemens and other authorities, the material of which the rivets are made should be very mild steel, the tensile strength not exceeding 26 tons per square inch. It is also needful to heat them uniformly throughout their entire length, and not to raise the points to a higher temperature than the heads, as is the usual practice with iron rivets, and they should not be heated beyond a bright red heat. When these precautions are taken, steel rivets will be found to resist steady strains and also jars and concussions much better than iron rivets.

It has been observed in many of the experiments made on the tensile strength of this material, that the specimens failed by crippling behind the pins, and also in the cases of the tests of riveted seams made on the Tyne, the opening of joint at a low stress seems to be due to the crippling of the material behind the rivets. It would therefore appear that a greater proportion of bearing surface is required with steel than with iron. As the strength of rivet steel bears a less ratio to that of the plates than ordinary iron rivets do to iron plates, it is probable that it will be found necessary to use a slightly larger area of rivet compared with the section of the plate than is the case with iron. This is a question to be decided by direct experiments, and the course adopted by the committee in requiring a specimen of the longitudinal seam of the shell to be pulled asunder, when sanctioning the reduction in scantlings of the steel boilers now being constructed, will afford some reliable data on this point. We failed to obtain any defined results regarding the strength of mild rivet steel to resist shearing.

One of the experiments made on the Tyne was with a steel and an iron box of about 2 feet 6 inches square, stayed so as to represent the combustion chamber of the boiler, and which were tested by hydraulic pressure to destruction. They were carefully gauged at various pressures, and the results clearly proved that flat plates of steel, stayed in the manner usual in combustion chambers, and with a reduction in thickness of 12 per cent. as compared with iron, have the same ultimate strength to resist buckling, but the deflection is much greater, and permanent set takes place earlier in steel than in iron.

Not less important than the strength of boilers constructed of steel is the effect of corrosion on this material as compared with iron. The scantlings of steel boilers being lighter than those of boilers made of iron, an equal amount of corrosion would considerably shorten their lives compared with iron boilers. Indeed, corrosion is the great difficulty with engineers of the present day, and there can be little doubt that the question of durability will exercise as much, if not greater, influence than lightness or increased pressure on the ultimate decision as to the adoption of steel for marine boilers. The experience of some years, however, will be needed to decide this point; and as the effects of corrosion on iron boilers vary with the different modes of treatment to which the boilers are subjected, it will even then be necessary, before forming an opinion upon the condition of an old steel boiler, to inquire what would have been the result with an iron boiler placed under similar circumstances and receiving exactly similar treatment.

In the paddle steamer Duke of Sutherland, belonging to the London and North-western Railway Company, there are two iron and two steel boilers working under identical conditions; and the paddle steamer Walney, owned by the Barrow-in-Furness Railway Company, is fitted with an iron and a steel boiler, both of which have been in use for about six years, also under identical conditions. By the kindness of Capt. Dent, marine superintendent of the London and North-western Railway Company, at Holyhead, and of Mr. H. Cook, secretary of the Barrow-in-Furness Railway Company, permission was given for an examination to be made of these boilers. The Duke of Sutherland is engaged in the trade between

Holyhead and Kingstown, and her boilers were made at the company's locomotive works at Crewe, about two years ago. They are of the old rectangular form, with dry bottoms and large steam chests through which the uptakes pass; they supply steam to a pair of oscillating engines with common jet condensers, made by Messrs. Robert Stephenson & Co., of Newcastle, and are worked at a pressure of 20 pounds per square inch. These boilers are in good condition, with the exception of some parts of the uptakes and sides near them; at these parts in both the iron and the steel boilers corrosion appears to be going on rapidly, and to a slightly greater degree in the steel boiler than in the iron one. No perceptible difference in the extent of corrosion could be observed in any part of the boilers below the water line, and the furnaces, tube plates, and combustion chambers appear to be in good condition; but as the boilers have not been in use for more than two years, and are fed from an ordinary jet condenser, it is not to be expected that they will yet show sufficient symptoms of decay upon which to express any definite opinion as to the relative corrosion in iron and steel.

In the case of the Walney, both boilers were made by Messrs. McNab & Co., of Greenock, in 1868. They are of almost the same description as those in the Duke of Sutherland, the pressure in this instance being 30 pounds per square inch. The engines to which they supply steam are a pair of steep engines with common jet condensers, also made by Messrs. McNab & Co. The material of which the steel boiler was made was manufactured by the Barrow Hematite Steel Co., while the iron boiler was made of Glasgow plates. Although it is now 10 years since the boilers were constructed, Mr. Mason, the company's superintending engineer, states that the whole time during which they have been employed is little over six years. As was to be expected, from the age of these boilers they are both considerably worn, but the deterioration caused by corrosion is much greater in the steel boiler than in the iron one; and especially is this so in the uptake, the back plates of the combustion chambers, furnaces and other parts subject to the action of heat. A very noticeable feature in the condition of these two boilers is that while the corrosion in the iron one is pretty equally distributed over all the boiler, in the steel one there is a great want of uniformity in the effects upon the different plates, some of the plates being apparently almost corroded through, and others by the side of them being in as perfect condition—so far as regards corrosion—as when they first left the rolls.

At an interview with Mr. J. T. Smith, the manager of the Barrow Hematite Steel Works, he explained that at the time these plates were made the knowledge and experience in the manufacture of Bessemer steel was comparatively limited, for manganese was scarcely known, and not used in any Bessemer steel works, and the general mode of making steel was such as to render it impossible to secure uniform results. Mr. McNab, the maker of the boiler, also states that he sometimes found great inequality in the material, even in different parts of the same plate. The results witnessed in the steel boiler of the Walney may therefore be due to the want of homogeneity in the plates used, and cannot be taken as a criterion of the effects of corrosion on mild steel as at present manufactured.

In conclusion, we would remark that in the construction of steel boilers greater care and attention must be exercised with the workmanship than is required in the case of iron boilers; and the difference between the two materials and the consequent different manipulation required in each case, must be realized, not only by the manager but by the workmen who will have to use the material; for, if steel plates are drifted heavily and knocked about as iron boiler plates usually are in boiler making, the material will be injured. We may expect to see steel boilers extensively used in preference to those made of iron, where lightness or increased pressure is an object, while if they are made with the care that this material requires, and eventually prove to be as durable as iron boilers, it will be a question whether a considerable reduction in the factor of safety may not be found quite compatible with perfect safety and efficiency.

After having given all the circumstances in connection with the whole matter our most careful consideration, we would respectfully submit that where it is proposed to use steel boilers in vessels intended for classification in this society's register book, the requirements of the case would be met by sanctioning a reduction from the scantlings prescribed by the rules for iron boilers, in the shell plates and stays to the extent of 25 per cent., and in the flat plates not subject to the action of heat, to the extent of 12 per cent., under the following conditions:

1. The material to have an ultimate tensile strength of not less than 26 and not more than 30 tons per square inch of section.
2. A strip cut from every plate used in the construction of the furnaces and combustion chambers, and strips cut from other plates taken indiscriminately, heated uniformly to a low cherry red heat, and quenched in water of 82 Fahr., must stand bending to a curve of which the inner radius is not greater than one and a half times the thickness of the plates tested.
3. All the holes to be drilled, or if they be punched, the plates to be afterward annealed.
4. All plates, except those that are in compression, that are dished or flanged, or in any way worked in the fire, to be annealed after the operations are completed.
5. The boilers upon completion to be tested in the presence of one of the society's engineer surveyors to not less than twice the intended working pressure.

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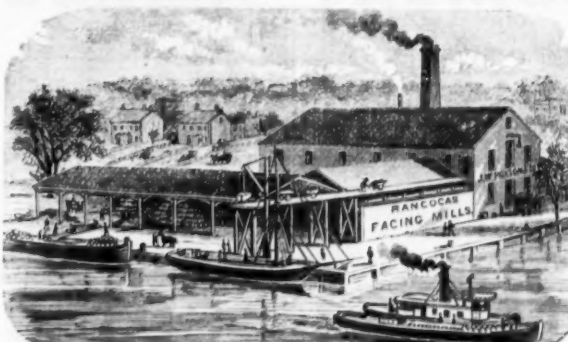
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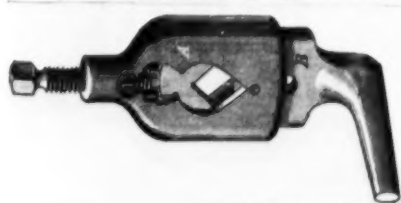
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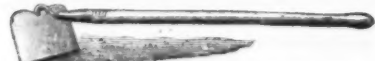
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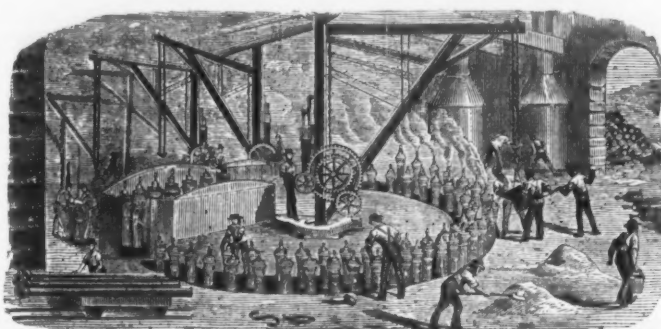
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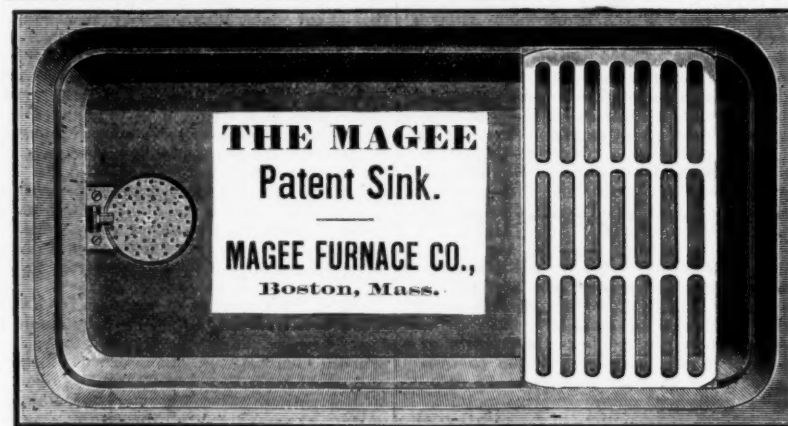
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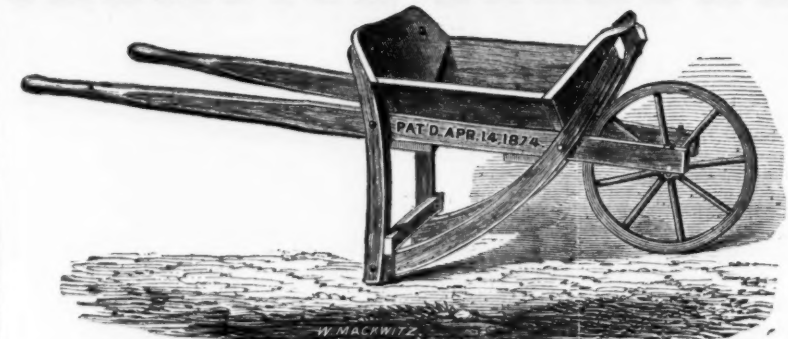


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II.

TYPE METAL.

Six parts lead and 2 parts antimony form a very hard and brittle alloy used for small type. Eight parts lead and 2 parts antimony form a softer alloy that is used for larger type.

Ten parts lead and 2 parts antimony form an alloy that is still softer, and is used for medium-sized type.

Fourteen parts lead and 2 parts antimony form an alloy that is softer than any of the above alloys, and is used for the largest-sized type.

A small amount of tin is sometimes added to the above mixtures, and some type foundries add 1 or 2 per cent. of copper. Both of these metals improve the quality of the type, when used in small quantities.

Forty parts lead, 5 parts antimony and 2 parts tin form an alloy that is used for stereotype plates.

Six parts lead and 2 parts tin form a coarse solder, used by plumbers. This alloy melts at about 500° Fahr.

Two parts lead and 4 parts tin form the fine solder used by tinners. It melts at about 350° Fahr.

LEAD ALLOYS.

Ninety-four parts lead and 6 parts antimony form an alloy that may be rolled into sheets, and is a little harder than pure lead. This alloy is much used for sheathing for ships.

Twenty-four parts lead and 4 parts antimony form an alloy that is used in place of Babbitt metal for filling small boxes and bearings.

Twenty parts lead and 4 parts antimony form an alloy that is a little softer than the above, and is used for the same purpose. Either of these may be hardened by the addition of more antimony; but care must be taken not to use too much antimony, for it will cause the alloy to lose its fluidity, and it cannot be run into the boxes.

All alloys of lead and antimony are rendered more fluid by melting them under a covering of oil.

Five parts lead and 5 parts tin make a beautiful white alloy, used for organ pipes. The mottled, or crystalline appearance, so much admired in the pipe, is caused by using an abundance of tin.

One hundred parts lead and 2 parts arsenic form an alloy from which drop shot is made.

Eighteen parts lead, 4 parts antimony and 1 part bismuth form an alloy that expands on cooling. This alloy is much used for metallic patterns for snap mouldings.

SPELTER-SOLDER ALLOYS.

A good solder for copper and iron is composed of 3 parts zinc and 4 parts copper.

A softer solder that is used for ordinary brass work is composed of equal parts of zinc and copper.

A very hard but fusible solder is composed of 2 parts zinc and 1 part copper. This solder is so hard and brittle that it can be easily crumbled in a mortar when cold.

The two first solders are first alloyed and cast into ingots. The ingots are allowed to cool in the mould and then reheated nearly to redness upon a charcoal fire, and are broken up on the anvil, or in a mortar, into a finely granulated state, for use.

HARD-SOLDER ALLOYS.

The following metals and alloys are usually used as solder in the art of hard soldering.

Fine or pure gold, rolled or beaten into sheets, and into shreds, or small pieces, is used as the solder for soldering chemical vessels made of platinum.

Silver solder, composed of 4 parts silver and 2 parts yellow brass is much used for hard soldering. The brass is used in this solder, so that the operator can tell when the solder is fused by seeing the blue blaze caused by the burning of the zinc. This solder is either rolled into thin sheets, and cut into small bits for use, or is granulated while hot.

The gold solder, the composition of which is given under the head of gold alloys, is rolled into thin sheets and used for soldering gold alloys. Gold soldering is generally done with the blow-pipe, as the work is seldom large enough to require the brazier's hearth.

Pure copper, in shreds, is sometimes used for soldering iron.

Spelter solders, granulated while hot, are used for soldering iron, copper, brass, gun metal, German silver and sometimes for gold and silver alloys.

As a cheap substitute for silver solder the white or button solders are commonly employed for the white alloys, such as German silver, gun metal, &c.

The flux most generally used in hard soldering is borax. In fact there is very little hard soldering done without the aid of this flux. It is generally granulated, and used in the dry state for large or heavy work, and for small work it is generally used in solution with water.

SOFT-SOLDER ALLOYS.

The soft solder used by plumbers, called sealed solder, is composed of 2 parts tin and 4 parts lead. This solder melts at about 450° F.

The common solder used by tinmiths is composed of 4 parts tin and 2 parts lead. This solder melts at about 350° Fahr.

The bismuth solder is composed of 7 parts bismuth, 5 parts lead and 3 parts tin. This solder melts at about 225° Fahr.

All the tin and lead solders become more fusible the more tin they contain. Thus, 1 part tin and 10 parts lead melt at about 550° Fahr., while 6 parts tin and 1 part lead melt at about 375° Fahr.; and all the tin, lead and bismuth solders become more fusible the more lead and bismuth they contain.

The fluxes used in soft soldering are borax, sal-ammonia, chloride of zinc, common resin, Venice turpentine, tallow and sweet oil. Those most commonly used for ordinary work are common resin and chloride of zinc.

BABBITT ANTI-FRICTION METAL.

This metal is made of 1 part copper, 3 parts tin, 2 parts antimony, and 3 parts more tin are added after the composition is in the molten state. This composition is called hardening, and when the metal is used for filling boxes, 2 parts tin are used to 1 of hardening. The above alloy consti-

tutes the best anti-friction metal in use, but on account of its expense it is very little used. The anti-friction metals commonly used are principally composed of lead, antimony and a little tin, but they are not near so good as the above.

FLUXES FOR ALLOYS.

The best flux for alloys of copper and tin is resin. It should be added when the metals are almost melted.

Another good flux is sal-ammonia. In using this flux the copper is usually melted first and the flux added. When it is in the mushy state, after the flux has been put in, the zinc and tin are then added.

A good flux for old brass is common resin soap. It should be added in small lumps and stirred down into the metal when in the molten state.

In forming alloys of different metals the molten metals should always be kept under a covering of black glass or pulverized charcoal to prevent oxidation.

BLACK FLUX.

Black flux, as it is commonly called, is composed of 7 parts of crude tartar, 6 parts of saltpeter, 2 parts of common bottle glass, and by some a small amount of calcined borax is added. These ingredients are first finely pounded and mixed together, and then gradually heated in an iron pot or ladle so as to burn them together. Care should be taken to not overheat the mixture, and as soon as it is thoroughly melted and mixed together it should be removed from the fire and allowed to cool. After it has cooled it is finely pulverized and sifted, and is then ready for use. It has a great affinity for moisture, and should be protected against it by being placed in glass bottles and the bottles corked up until wanted for use. This is the most powerful flux that can be made. It is but little used in forming or fluxing alloys, but it is principally used by assayers in assaying of different kinds of metallic ores. In these assays the quantity of black flux used varies according to the quality of the ore, but the amount generally used is about an equal amount of ore and flux. The ore is first roasted and then finely broken up and mixed with the flux, and the whole is then rapidly heated in a crucible. If the flux does not make the slag sufficiently fluid to allow the metal to settle, a small amount of calcined borax is added, which makes the slag more liquid, and permits the metal to pass to the bottom of the crucible. The crucible is then removed from the fire and the mixture either poured from it or allowed to cool in it. After it has cooled the slag is knocked off with a hammer and a button of metal obtained. When using this flux the clay crucible, without either coal or plumbago, is preferred, for the flux is very hard on a crucible that contains either of these substances. Black flux is used by some foundrymen in melting the fine scrap sweepings from the floor, and dross and refuse from the crucibles, by melting these in a crucible with black flux. They obtain considerable amounts of metal from them that would otherwise be lost. In melting this refuse with black flux the common clay crucible should always be used.

NATURE AND CHARACTER OF ALLOYS.

Alloys of gold, silver and copper are generally superior in strength to any of the more fusible metals, and may be forged either when red-hot or cold. These three metals seem to unite in any proportions, and always form an alloy that is malleable when either hot or cold.

Pure gold is but little used in the arts; it is then too soft. It is generally alloyed with silver and copper, both to harden it and depreciate its value. Alloyed with copper, it forms gold of a red tint; with silver, it forms gold of a green tint; and alloyed with both copper and silver, it gives intermediate tints.

Pure silver is but little used alone; it is generally alloyed with a small amount of copper, which does not change its color, and greatly improves its malleability and working qualities.

When gold, silver or copper are alloyed with the more fusible metals—lead, tin and zinc—the alloy is less malleable and ductile than alloys of gold, silver and copper. They are extreme red-hot, and when heated to redness they fly to pieces under the hammer; and alloys of brass, bell metal, &c., must be treated with precaution, and should never be taken out of the mould while red-hot.

Alloys of 2 parts copper and 1 part zinc are very soft and malleable, and may be drawn by hammering or easily cut with a file, but an alloy of 1 part copper and 2 parts zinc is as hard and brittle as glass, and may be easily pulverized.

An alloy of 2 parts copper and 1 part lead makes a soft, malleable metal, but is inferior to an alloy of copper and zinc. In alloys of 1 part copper and 1 part lead the lead will ooze out in cooling. In alloys of 1 part copper and 2 parts lead the lead will not unite, but will sink to the bottom when cooling.

Alloys of 6 parts copper and 1 part tin make a very hard alloy, and the alloy gets harder and whiter the more tin is added. Alloys of tin and copper should not be too rapidly exposed to the air, for if a large percentage of tin is used it will strike to the surface and ooze out or make hard spots in the casting.

Alloys of zinc and lead cannot be made without the addition of arsenic, unless the lead is alloyed in a very small quantity.

Alloys of zinc and tin are very hard and brittle, and are but little used alone. By the addition of copper to alloys of these two metals, the alloy is rendered more malleable and soft.

Arsenic makes all alloys hard and brittle, and is very dangerous to use. It is seldom used except to impart fluidity to the very infusible metals.

Alloys of lead and tin are very malleable and ductile when cold, but at a temperature of about 200° Fahr. they lose the power of cohesion and are exceedingly brittle. The alloys of tin and lead partake of the general nature of these two metals. They are soft and malleable when cold, even when a small amount of brittle antimony has been added.

An alloy of 6 parts lead and 1 part antimony is very soft and malleable, but an alloy of 3 parts lead and 1 part antimony is very hard and brittle; and an alloy of 1 part lead and 1 part antimony is harder and more brittle than antimony.

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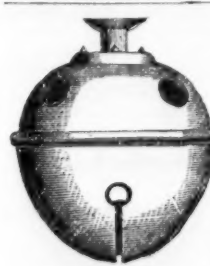
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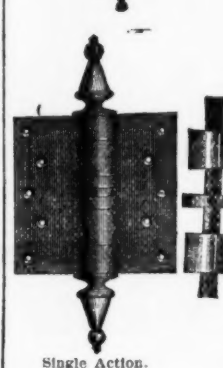
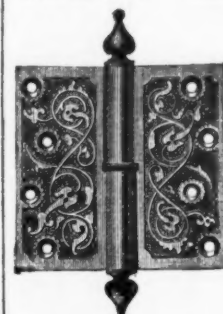
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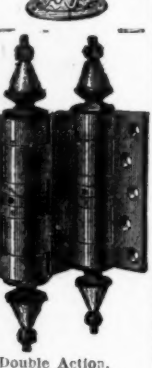
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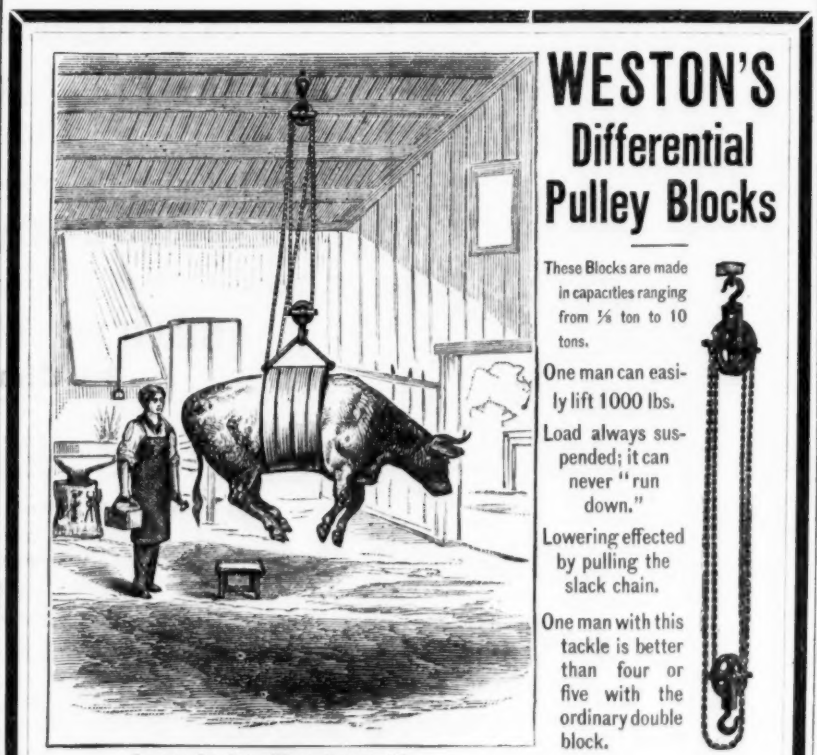
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Lowering effected by pulling the slack chain.

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The application of the Differential Pulley for the lifting of animals has been most satisfactorily tested. It enables the veterinary surgeon to sling up a horse or animal without injury, while performing surgical operations on it. The blacksmith can advantageously apply the blocks to a variety of uses, with economy of time and labor.

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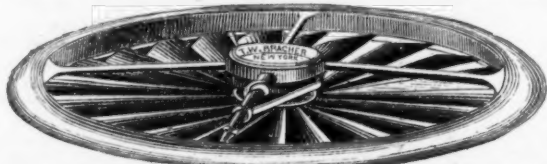
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Kitchens, Laundries, &c., ventilated without draft. Durable, strong, without rivets or solder. Oiled for six months. Each one has storm cap. Retail price, size six inch diameter, \$1.00 and upwards; apparatus with which any one can cut circles in glass, 15 cents each.

Protective Ventilators avoid drafts, exclude dust, dampness, malaria and germs of disease; adopted by hospitals, schools, institutions, &c.; applied to any window or room.

Prof. A. L. Loomis, M. D., University of City of New York, writes as follows: "From my personal experience and that of my patients who have used your Ventilator during the past six months, I am convinced that your method of removing dust, impurities and dampness from the atmosphere is the best which has as yet been proposed. By it the air in an apartment can be constantly changed without causing drafts. I would especially recommend its adoption in sick rooms, sleeping apartments, nurseries and school rooms."

Air Filters and Moisteners, placed over hot-air registers of furnaces, &c., prevent dust and supply steam filtered air. Prices and discounts to the trade sent on application.

The "Economy" Molding Weather Strip is perfect in every respect. By enlarging edge of rubber or felt, and making slot in molding to correspond (see engraving), we save all after expense of molding. Once purchased it will last a lifetime, because rubber, etc., has only to be removed by taking old piece out of either end of molding, and sliding in a new piece. By this method of securing rubber all uncertainty of fastening or undoing of glue or tacks is overcome.

Rubber supplied with enlarged edge and instructions to enable Car Manufacturers, Carpenters, Builders and far off trade to make slots in Sashes, Doors, Mouldings, &c., and thus make perfect Weather Strips.



BRACHER VENTILATOR CO., No. 3 Park Row, New York.

RUBBER-CUSHIONED AXLE

Assures in its Use
SAFETY, COMFORT and ECONOMY.

Vibration, Jolting, Pounding and Noise largely decreased, reducing Wear and Tear to a minimum. Approved and endorsed wherever used. Correspondence solicited.

THE RUBBER-CUSHIONED AXLE CO.,

Broadway and 43d Street, (Long Acre), - - - NEW YORK.

STANLEY RULE AND LEVEL CO.,

MANUFACTURERS OF

IMPROVED CARPENTERS' TOOLS.

Factories,

New Britain, Conn.

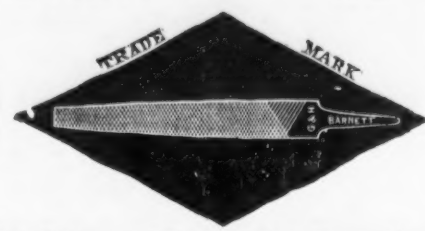
Warehouses,

35 Chambers St., N. Y.

No. 102, Iron Block Plane, 5 1/2 inches in length, 1 1/4 inch Cutter \$6.00 per doz.



Black Diamond File Works.



Awarded by Jurors of Centennial Exposition, 1876, for
"VERY SUPERIOR GOODS."

G. & H. BARNETT,

39, 41 & 43 Richmond St., Philadelphia.

CHARLES B. PAUL,
Manufacturer of HAND CUT FILES.

Warranted CAST STEEL. 187 Tenth Street, Williamsburgh, New York.
All descriptions of Files made to order. Price List mailed on application. Established 1863.

Quality Unsurpassed.

Every File Warranted.

THRIFT FILE WORKS.

To the Hardware Trade.—
GENTS: We desire to call your attention to our brand of HAND-CUT FILES. The files we offer are of equal quality, and made by the same process as those manufactured by Stubs, Butcher, Spencers and others, of Sheffield, England, and we shall so continue to manufacture them until we become satisfied that the American Market demands an inferior File at a lower price, which can only be produced by



the introduction of machinery for cutting, which, to this time, we have not thought advisable to introduce in our works, as our files have been tested by the largest and most experienced consumers, who have decided the great superiority of HAND-CUT over Machine-Cut Files, and advise us to continue the original process of CUTTING BY HAND as the only method of producing a first-class and strictly reliable article.

R. H. HOWARD & CO., Nos. 428 & 430 Ireland St., Phila.

AUSABLE HORSE NAILS
POLISHED OR BLUED.
HAMMERED AND FINISHED



The Ausable Nails

Are Hammered Hot,

And the Finishing and Pointing are Done Cold,

Thus Imitating the Process of Making Nails by Hand.

Quality is **Fully Guaranteed.**

For Sale by all Leading Iron and Hardware Houses.

ABRAHAM BUSSING, Secretary,
35 Chambers St., New York.

Bolt and Rivet Clippers,

For cutting off the ends of bolts and rivets, on carriages, wagons, harness, &c.

SEND FOR A CIRCULAR AND PRICE LIST.



Liberal discount to the trade.

Chambers, Bro. & Co.,

PHILADELPHIA.

THE ULSTER SLED.



Runners and Cross Bars of one piece of metal, either Cast Steel or Iron, making the strongest as well as prettiest Sled ever made. Its grand success of last year is a guarantee for an immense sale this year. Possessing all the qualities of a perfect sled—unique in design, beautiful in finish—makes the Ulster the favorite with children of both small and large growth. A splendid holiday present.

Trade Mark, Registered Oct. 23, 1875. Patented March 13, 1877.

CROSBY, GILZINGER & CO., Rondout, N. Y.

Patentees and Manufacturers of

The Sheridan Velocipede, Centennial Carriage, Sulky and Seat Springs, Centennial Seat Fast and Dexter Shifting Bars.

FILES & RASPS,

Best Cast Steel.

HAND-CUT. Manufactured by
JOHNSON & BRO.
No. 1 Commercial Street, Newark, N. J.

ESTABLISHED 1860.
Chas. Spruce & Co.,
Manufacturers of HAND CUT
FILES AND RASPS.

Every File warranted.
CHALMERS & MURRAY,
Sole Agents, 76 Reade St., New York.

HORSE RASPS AND FILES.

We invite the attention of the trade to our Celebrated American Horse Rasps & Files, made from the very best American Steel, all cut by hand, and warranted to give entire satisfaction. All Rasps & Files not stamped as the annexed incorporated trade mark are not genuine. Sold by Hardware Dealers generally.



Government Standard, Hot Forged Hammer Pointed HORSE SHOE NAILS.

Made from the best of Norway Iron, and warranted never to split or sliver in driving.

PUTNAM NAIL CO.,
NEPONSET, MASS.

SPENCER & UNDERHILL,

94 Chambers St., N. Y., Agents for
American Screw Co.'s Wood, Machine and Rail Screws, Stove and Tire Bolts, Rivets, &c.
O. Ames & Sons, Shovels, Spades and Scoops.
A. Field & Son, Tacks, Brads, Nails, &c.
G. F. Warner & Co., Carriage Clamps.
We have also on hand a general assortment of Hardware

Sugar Maker's Friend.
Agents wanted in every Sugar District to canvass for the sale of
Post's Patent Metallic Eureka Sap Spout and Bucket Hanger. Samples, Circulars and Terms sent postpaid on receipt of 2 cents. Address
C. C. POST, Manuf. & Patentee, Burlington, Vt.

GEO. F. EBERHARD & CO.
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PRACTICAL MAKERS OF PLAIN AND ORNAMENTAL
PATTERNS & MODELS
OF WOOD AND METAL OF EVERY DESCRIPTION
PATENT OFFICE MODELS, &c. &c.
MANUFACTURERS OF MALLEABLE IRON SPECIALTIES & HARDWARE

CARRIAGE SPRINGS.

JOHN H. REOCK, PASSAIC SPRING WORKS,
Manufacturer of Railroad Car, Locomotive, Omnibus Springs and every variety of Carriage and Sleigh Springs.
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CHAS. E. LITTLE, 59 Fulton St., N. Y.



Solid Cast Steel Pump Augers
For Boring PUMP LOGS. All sizes in stock. Socket Shanks, Ring Handles, and Connecting Rods for the above to order. Also Trenching Tools for joining log ends. **Coopers' and Slaters' Tools.** Tool Chests. Tools for all trades a specialty.

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DESIGNERS AND
ENGRAVERS OF WOOD
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A. FIELD & SONS,

TAUNTON, MASS.,

MANUFACTURERS OF

Copper and Iron Tacks, Tinned Tacks, SUPERIOR SWEDES IRON TACKS!

For Upholsterers' Use, Saddlers' Supply, Card, Clothing, etc., etc.

American and Swedes Iron Shoe Nails.

Zinc and Steel Shoe Nails, Carpet, Brush and Gimp Tacks, Common and Patent Brads, Finishing Nails, Annealed Trunk and Clout Nails, Hob and Hungarian Nails, Copper and Iron Boat Nails, etc.

Patent Copper Plated Tacks and Nails,

FINE TWO PENNY & THREE PENNY NAILS,

Channel, Cigar Box and Chair Nails, Leathered Carpet Tacks, Glaziers' Points, etc.

Offices & Factories at Taunton, Mass.

Warehouse at 78 Chambers St., New York,

where may be found a full assortment of Tacks, Brads, &c., for the accommodation of the New York Wholesale and Jobbing Trade.

Any variations from the regular size or shape of the above-named goods made from sample to order.

Hoisting Machinery
MANUFACTURED BY
CRANE BROTHERS MFG. CO.,
Chicago.

John Chatillon & Sons,
91 & 93 Cliff St., N. Y.



MANUFACTURERS OF
SPRING BALANCES,
Patent Balances,
Union & Counter
SCALES
SPIRAL SPRINGS,
Fenn's Faucets & Cork Stops.

Geo. M. Eddy & Co.,
351 & 353 Nassau Ave., Brooklyn, N. Y.
Manufacturers of

MEASURING TAPES.
Of Cotton Linen and Steel.

For all purposes for which Tape Measures are required.

Only manufacturers of

Paine's Patent U. S. Standard Steel

Measuring Tapes,

Pat. Spring Measuring Tapes

of Linen and Steel.

FINE TEMPERED STEEL SPRINGS.

FINE TEMPERED STEEL BAND SAWS.

From 1/2 inch wide upward. Warranted tougher than

any other Band Saw. Catalogues on application

PRIZE MEDALLISTS:

London, 1862; Oporto, 1865; Dublin, 1865; Paris, 1867; Moscow, 1872; Vienna, 1873, and only Award and Medal for Self-Coiling Steel Shutters at Centennial Exhibition, Philadelphia, 1876.

CLARK & CO.,

ORIGINAL INVENTORS AND SOLE

PATENTEES OF

Noiseless Self-Coiling Revolving

STEEL SHUTTERS,

FIRE AND BURGLAR PROOF.

Also Improved

Rolling Wood Shutters

Of various kinds. Clark's Shutters are the Best and Cheapest in the world. Are fitted to new Tribune Building, Lenox Library, Delaware and Hudson Canal Co.'s Building, Transatlantic Steamship Co.'s new Dock, American News Office, &c., Posey County Court House, Mt. Vernon, Holt County Court, Oregon, Mo. Also to buildings in Boston, Cincinnati, Detroit, Janesville, Wis., Baltimore, Canada, &c. Have been for years in daily use in every principal city throughout Europe, and are endorsed by the Leading Architects of the World.

Office and Manufactory,

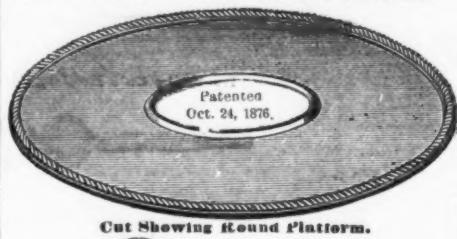
162 & 164 West 27th Street, N. Y.

ANSONIA CORRUGATED STOVE PLATFORM

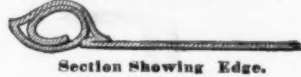
Manufactured by the

Ansonia Brass & Copper Co.

Office, 19 & 21 Cliff Street,
NEW YORK.



Cut Showing Round Platform.



Section Showing Edge.

ANSONIA Bronzed Fire Screen,

With Ornamented Mouldings.

PATENT APPLIED FOR.

The Portable Bronzed Fire Screen or Shield, as shown in the illustration, is especially designed for the safety and protection of walls, furniture, woodwork, paper or varnish from heat. Being constructed of metal, with firm and substantial edges, curved in form to stand alone, it may be easily adjusted to any position about a stove, before a grate or fire place. The demand for something useful, durable and ornamental as a Fire Screen has long been felt, and having finally accomplished the desired result, we are prepared to fill all orders promptly.



To the Hardware Trade.

A General assortment of

HARDWARE

For the country trade constantly on hand.

JOHN I. BROWER & SON, 288 Greenwich Street, New York.

JOWETT'S HORSE RASPS, 14, 15 and 16 IN.

Agents for Maharay's No. 1 Tire Shrinker, Heller's Rasps, Clark's New Pat. Sash Fasteners. Send for Circular.

L. BAILEY'S POCKET BLOCK PLANE

We desire to call special attention to our New JOINTERS' POCKET BLOCK PLANE. We believe this tool when once seen will speak for itself more pointedly than anything we could possibly say. It is simplicity itself, both in construction and operation, and the nicest working tool ever made, and specially recommended for amateurs, pattern makers, light scroll saw work, etc., etc.

No. 12, 4 1/2 in. in length, 1 1/4 in. cutter, japan'd finish, polished trim- mings.....	each.	\$2.50	\$10.00
No. 12 1/2, 4 3/4 in. in length, 1 1/2 in. cutter, japan'd finish, nickel-plated trimmings.....	each.	1.00	12.00



Send by mail, postage paid, on receipt of price.

Patented October 9, 1877.

Send for Illustrated Catalogue and Price List

LEONARD BAILEY & CO., Hartford, Conn.

DARLING, BROWN & SHARPE

Providence, Rhode Island,

MANUFACTURERS OF

United States Standard Rules,

AMES' UNIVERSAL SQUARES,

Patent Hardened Cast Steel Try Squares.

THE AMERICAN STANDARD WIRE GAUGE,

Bevel Protractors, Hardened T Squares and Bevels, Center Gauges, Steel

German Silver and Boxwood Triangular Scales, Venier Calipers,

Caliper Squares and Rules, Plumb Bobs,

Paper Drawing Scales, Willis' Odontographs, Steel Straight Edges

and T Square Blades.

MEDALS AWARDED: Paris Exposition, 1875; Vienna Exposition, 1873; Philadelphia, 1876.

Illustrated Catalogue sent per mail on application.

INDUSTRIAL ITEMS.

MAINE.

The Pembroke Iron Works are now in operation.

MASSACHUSETTS.

The Bradley Car Works, at Worcester, are engaged on a contract for 40 open cars for excursions on the New York and Manhattan Narrow Gauge Railroad at Coney Island. Two smoking cars for the Lowell and Nashua road are nearly ready for delivery.

The pay day at the American Watch Company's factory, Waltham, has been changed from the 11th to the 13th. It is reported that there will be no vacation at the watch factory the coming season on account of the great rush of business.

The Parker Mills Nail Factory, at Wareham, and also the Rolling Mill connected at Tihonet, have resumed operations after five weeks' inaction.

The Bay State Horse Rake Company, of Winchendon, are making large shipments to France and Germany, and have secured space at the Paris Exhibition.

A lot of shovels and spades of all sizes and descriptions are on their way to the Paris Exposition from the Ames Works at North Easton.

Twelve thousand needles a day is the present manufacture at Charles Howard & Co.'s establishment in Brockton.

Joel Hayden has offered to settle with the creditors of Hayden & Co., 33 1/2 per cent. on 22 months' time, in 10 installments, without security. The latest rumor is that one of the creditors expects to buy out the others for about 25 per cent. and will continue the business. The Haydensville Savings Bank is under temporary injunction, restraining it from doing business until some plan can be devised for equalizing the loss from the Hayden failure.

There can be little doubt that Greenfield must suffer considerably in the near future by the removal of the John Russel Cutlery Company's workmen and their families to Turners Falls. The company is doing a fine business at the latter place, and the 300 or 400 workmen mostly live in Greenfield in the vicinity of the former factory, and go back and forth on trains run especially for their accommodation and at very low commutation rates.

The iron works at New Bedford which, in 1869, cost \$2,500,000, recently sold for \$361,141, a loss of \$2,138,859.

The prospects for a good run of business at the Wason Car Company's works, at Springfield, during the present season are very flattering. There are now 50 new passenger cars under contract for the two new railroads running from Brooklyn to Coney Island, which are to be finished by the first of June, and a number of lesser contracts are also to be filled. There are as many cars contracted for as were built last year, so that if no more contracts should be made the amount of work turned out will equal that of 1877. Some 200 men are now employed at the establishment, and from 250 to 300 will have work during the summer.

The Florence Machine Company, formerly the Florence Sewing Machine Company, have chosen these officers: President, D. G. Littlefield; treasurer, H. F. Dibble; directors, Sidney Strong, S. M. Smith, Webster Herrick, H. G. Knight, W. B. Hale and I. E. Parsons. The company are now building a new machine, combining many of the points of the old "Florence," which they will put into the market this spring.

Jerome Wheelock, of Worcester, is having a huge pulley balance wheel constructed by the Hartford (Conn.) Foundry and Machine Company, to be used on the engine which he is building for the Paris Exposition. The wheel is 20 feet in diameter, 37 inches across the face, and will weigh 21,000 pounds. It will receive a belt 36 inches wide and is being cast whole.

CONNECTICUT.

The Vulcan Iron Works (of New Britain) Company have begun digging for the foundation of their factory building.

At a meeting of the Miller Bros. cutlery company, of Meriden, nearly all the creditors accepted the terms of 20 per cent. on 60 days' credit, or 30 per cent. in stock in a new organization.

William Jessop & Sons, Sheffield, England, bought at sheriff's sale, Wednesday, through their agents, Messrs. Mersick & Woodford, of New Haven, the machinery in the factory of the New London Horse Nail Company for \$3000. The building and real estate of the company is already owned by the Messrs. Jessop. The machinery will probably be removed to Northampton, Mass.

The Billings & Spencer Company, of Hartford, are running full time in all departments, and in some departments overtime. Their drop forgings are in demand, and a large portion of their orders are for pistol parts, and lately they have begun to drop-forging the cylinder blanks, which have heretofore been cut off from the steel bar.

The Howe Sewing Machine Company have paid up all their indebtedness, and are now running their factory at Bridgeport with about 300 hands.

NEW YORK.

Messrs. D. M. Osborne & Co., of Auburn, are now employing 900 men in their factories. They are making from ninety to one hundred mowers and reapers per day, and are shipping their goods all over the world.

NEW JERSEY.

The Ferracute Machine Company, of Bridgeton, have shipped some of their machinery to Japan.

PENNSYLVANIA.

The Rod Mill on the Flat commenced running double turn Monday night. Even with the resulting increase of its product, the Wire Mill on Portage street can use the rods faster than they can be furnished it. Three new drawing tables have been placed in the latter, which will give employment, when occupied to their full capacity, to about 30 additional hands.—*Johnstown Tribune*.

It is rumored that the rolling mill and nail factory of E. & G. Brooke, which have been idle for necessary repairs, will resume operations this week. The cylinders of both engines of the works have been enlarged to regulate the motion of the machinery more uniformly.

Oley Furnace blew out this week, its stock of charcoal being all consumed. This is believed to be one of the oldest furnaces in the State. A sandstone over the earth contains the names of the builders and the date 1752.

The Pennsylvania Iron Works, at Danville, have made another two weeks' start.

We clip the following from the Sharon Herald of the 15th inst.: During the week closing Saturday, 9th inst., at the Western Iron Works, guide and hoop mills ran double turn; bar and sheet mill single turn; puddle mill and nail factory off; both furnaces doing well, as usual; chain factory, 16 fires on, making some very excellent chains. They cannot keep up with their orders. The manager says that he would run all the fires if he could get men, so it seems that in this one branch of industry the supply does not keep up with the demand. At the new mill, puddle, bar, guide and both hoop mills double turn; nail factory on all week; patent process still giving satisfaction at the Keel Ridge Furnace. At the Stewart Iron Works, bloom mill closed up on Tuesday, the 5th inst. A petition has been in circulation among the ironworkers and others interested, praying against any reduction of the import duties on iron.

The Erie Rolling Mill will be put into operation in a short time.

It is reported that the Phoenix Iron Company have secured the contract for the construction of an aqueduct across the Hudson River; also that owing to the promising aspect of business, they will not construct any more of the New York Elevated Railway.

Thirty tons of steel wire per day are now turned out at the pulling mill in Conemaugh borough, Cambria county. The smallest size made at present is 1-36th of an inch in diameter.

Orders were received on Wednesday, the 15th, by the operatives at the Moselem Furnace to blow out at once. No cause is reported for this unexpected order.

The glass works of G. W. Wells, at Brownsville, suspended operations recently. The firm has since failed.

McLanahan, Stone & Bayles, Hollidaysburg, have just shipped 54 tons of the McLanahan patent closed solid top hot-blast pipes to the Glamorgan Furnace, Lewistown.

The Weiner Machine Works, Lebanon, are engaged in erecting one of P. L. Weiner's hot-blast ovens in Messrs. Eckert's furnace.

The yield of the Warwick Iron Company's Furnace, at Pottstown, last week was 306 1/2 tons, which is more than any furnace in the Schuylkill Valley ever made in one week.

Messrs. S. Barnes & Co., Rochester, have just completed a contract made with Messrs. Kimberly, Carnes & Co. for a lining for Keel Ridge Furnace, Sharon, and recently contracted with the Crowther Iron Company for their Clara Furnace, and with the Etna Iron Company for the No. 2 Etna at Newcastle, for a lining and bosh each. The Clara is 16x65, and the Etna 15x50.

PITTSBURGH AND VICINITY.

No. 2 Lucy Furnace is again in blast.

Macintosh, Hemphill & Co. are turning out some very fine work for the new South Pittsburgh Rail Mill.

Arrangements have been entered into by the Cambria Iron Co. for the manufacture of Williams' patent horse shoe, that has already been illustrated in our columns. The necessary machinery will be procured at once.

The Edgar Thomson Steel Works have moved their city office into the elegant and commodious rooms fitted up for their especial use, No. 48 Fifth avenue. They now have the handsomest offices in the city.

The affairs of the Pittsburgh and Newcastle narrow-gauge road have progressed so far that four locomotives have been ordered from Porter, Bell & Co., two to be finished about the middle of April and the other two by the 10th of July.

WEST VIRGINIA.

The Crescent Mill, Wheeling, resumed work on the 14th inst.

The contract for furnishing steam pumps, &c., to supply the penitentiary with water, has been awarded to E. A. McCormack, of Pittsburgh. The pump will have a capacity of 250,000 gallons per day, and will be ready for operation within 60 days.

The Top Mill Nail Factory, Wheeling, has 20 of the Coyne patent nail pickers on trial at the works. If they give satisfaction they will be put on all the machines.

OHIO.

The Barney & Smith Mfg. Co., at Dayton, have completed a very convenient and well-fitted pay car for the Columbus and Hocking Valley road.

The Sarah Furnace is 50 feet high, with a 14 feet bosh and five blast tuyeres. A bell and hopper, worked by the ordinary counter weight crab, closes the top. There are three Whitwell ovens, each 15 feet in diameter and 38 1/2 feet high. The smoke stack, which presents a fine and symmetrical appearance, is made of boiler iron lined with fire-brick; its total height is 108 feet. The base is 14 feet high and 12 feet square, the inside diameter, being uniform throughout its length, is 5 1/2 feet. The upright blowing engine, built by Lambert & Gordon, has a 72-inch blast cylinder and a 34-inch steam cylinder—3 feet stroke. There are two batteries of boilers, three to a battery, or six in all, each having two flues and being 42 inches in diameter and 28 feet long. The hoisting-house consists of six iron columns, similar in every respect to the hoist at the Iron and Steel Company's Furnace, the cages or platforms being worked by Crane Bro.'s steam hoisting engine. Water is supplied from the river and distributed by three large Cameron pumps. There is a reservoir for water near the engine house, and three ice breakers are planted in the river above the furnace to protect the boats at the incline. The buildings are all substantial but plain. The brick-walled and iron-roofed casting house is 45 by 75 feet. The engine house, which is also built of brick and roofed with iron, is 30 by 40 feet. The stock house, a heavy frame with iron roof, is 66 by 105 feet. The office, in which there is a brick fire-proof vault for books and papers, is a neat one story frame structure, 20 by 46 feet. Like some old-fashioned farm houses, it is a double ender, the platform scales, over which lime and other wagons are

RUSSELL & ERWIN MANUFACTURING COMPANY

Manufacturers of HARDWARE.

FACTORIES, - - - NEW BRITAIN, CONNECTICUT, U. S. A.

MANUFACTURERS' AGENTS AND DEALERS IN GENERAL HARDWARE AT OUR

WAREHOUSES: NEW YORK, 45 & 47 Chambers Street; PHILADELPHIA, 425 Market Street; BALTIMORE, MD., WM. H. COLE, Agent, 17 South Charles Street.

Long-Eye Cast Steel Bright Lip or Cuban Augers.



Post Augers.



Long-Eye Augers, (Black Lip).



Short Bright Augers.



Cook's Ring Augers.



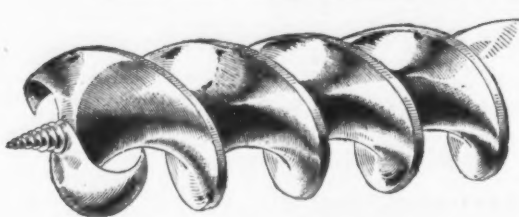
Short-Eye Augers, (Black Lip).



Long Bright Augers.



Cook's Patent Augers and Bits.



D. Mfg Co's Millwright Augers.



D. Mfg Co's Cast Steel Bits.—EXTRA.



Superior Gas Fitters' Augers.



Cook's Cast Steel Bits.



D. Mfg Co's Car Bits.
12 inch twist.



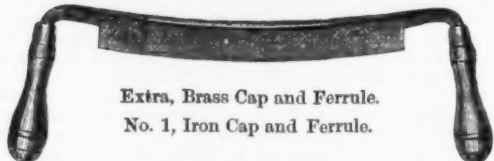
Cast Steel Machine Bits.



D. Mfg Co's Boring Machine Augers and Bits.

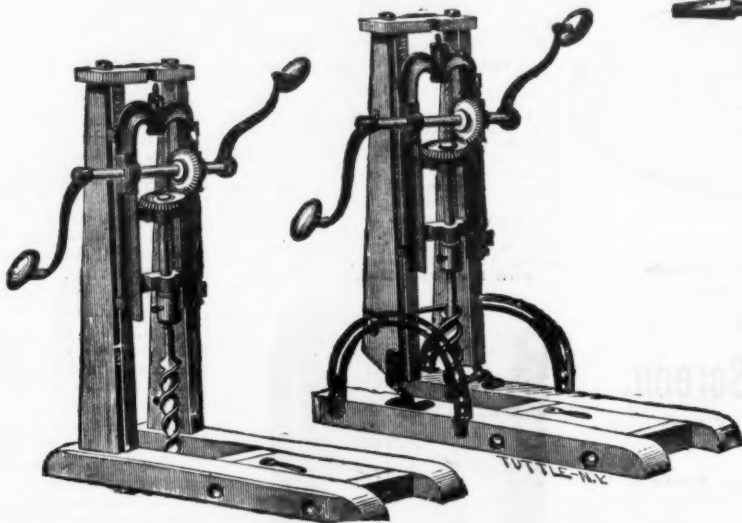


Drawing Knives.



Extra, Brass Cap and Ferrule.
No. 1, Iron Cap and Ferrule.

Farmers' Drawing Knives.



Improved Boring Machines, Graduated Ways.

Shingle Knives.



Wagon Maker's Drawing Knives.



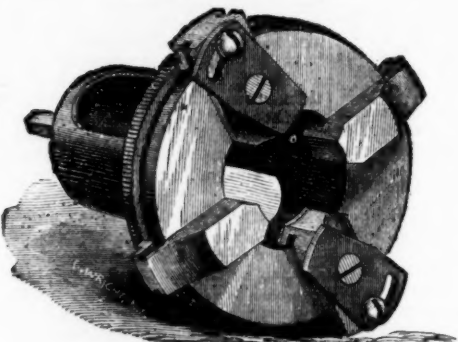
Blake's Expanding Bit.



Douglass' Patent Auger Handles.



Universal Hollow Augers.



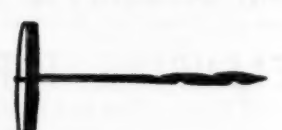
Improved Hollow Augers.
Douglass' Patent.



Screw Drivers.



Steel Gimlets.



Chisel Handles.



Carpenters' Slicks.



D. Mfg Co's Firmer Chisels.—EXTRA.



Millwright's Firmer Chisels.—EXTRA.



Oval Back Socket Framing Chisels.—EXTRA.



Socket Framing Chisels.—EXTRA.



Corner Chisels.



Socket Firmer Chisels.—EXTRA.



Socket Framing Millwrights' Chisels.



Turning Chisels.—EXTRA.



Turning Gouges.—EXTRA.



C. S. Paring Firmer Gouges.—EXTRA.



D. Mfg Co's Firmer Gouges.—EXTRA.



Reamers.



Ring Tap Borers.



Superior Socket Firmer Gouges.



Screw Driver Bits.



Counter Sinks.



SOLE AGENTS FOR DOUGLASS MFG. CO.'S TOOLS.

Cutlery.

FRIEDMANN & LAUTERJUNG,

Manufacturers of PEN AND POCKET CUTLERY.

Solid Steel Scissors, Shears, Razors,
Russia Leather Straps, Hones, &c.

Sole proprietors of the renowned full concave patent

"ELECTRIC RAZORS,"

And the celebrated "ELECTRIC SHEARS." Nickel Plated
Hones.

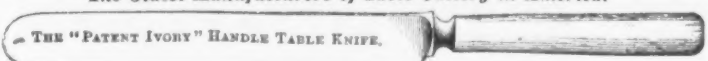
Agents for the BENGALL RAZORS.

AMERICAN TABLE CUTLERY, BUTCHER KNIVES, &c.

91 Chambers and 73 Reade Sts., N. Y. 423 N. Fifth St., ST. LOUIS, MO.

MERIDEN CUTLERY CO.

The Oldest Manufacturers of Table Cutlery in America.



EXCLUSIVE MAKERS OF THE

CELLULOID

Or "PATENT IVORY" KNIFE. The handsomest and most durable substitute for Ivory known. Also
makers of all kinds of TABLE, BUTCHER AND HUNTING KNIVES.
Illustrated catalogues with prices sent to the trade on application. 49 Chambers St., New York.

THE
LAMSON & GOODNOW
88 CHAMBERS ST.
MFG. CO. N.Y.
GARDNER'S PATENT
AMERICAN TABLE
CUTLERY & C.

H. WILKINSON'S

Superior Solid Cast Steel Blades

SHEARS and SCISSORS.



H. WILKINSON,

Manufacturer of Original "Wilkinson" Goods,
Collinsville, Connecticut.

NAUGATUCK CUTLERY CO.,

Manufacturers of FINE PEN & POCKET CUTLERY.

FULLER BROS., Sole Agents, 89 Chambers and 71 Reade Sts., N. Y.

HALL, ELTON & CO.,

Electro Plated Ware, German Silver and Britannia Spoons.



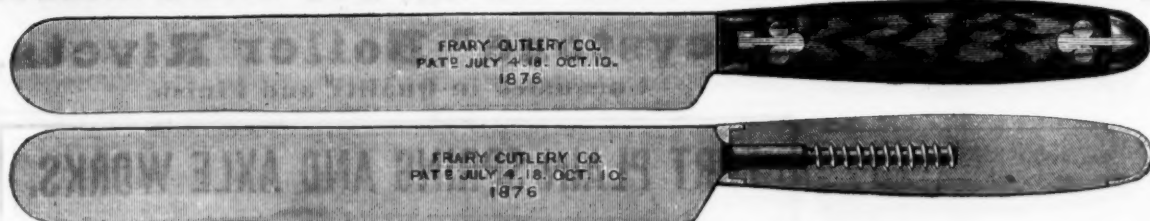
Factories, Wallingford, Conn.

Salesroom, 75 Chambers Street, New York.

THE FRARY CUTLERY COMPANY,

FACTORY, Bridgeport, Conn. NEW YORK OFFICE & WAREHOUSE, No. 82 Chambers St

Manufacturers of all kinds of Table Cutlery.



The above illustrations represent their New Patent Screw Tang Lock Fast Solid Handle Knife.

There is no question but that a solid handle knife is much more preferable than a scale tang. The great objection to their use hitherto is, that no solid wood handle has been placed on the market with the handle properly secured—no handle put on with cement will stand the wear and tear of every day usage. The cement will expand and contract with the action of heat and cold, and become loose, crack and come off, causing great prejudice against their use. This objection is overcome in our patent screw tang. A wood screw is welded to the tang of the knife or fork, and screwed firmly and securely in the handle and locked there by the bolsters, making a very strong neat and handsome knife, which we warrant never to get loose, crack or come off. We manufacture a large variety of patterns, both Table, Butcher and Carvers, and furnish the patent handle nearly as low as the scale tang. We are prepared to furnish this line of goods, together with the scale tang and iron handle, very promptly, and very respectfully invite the attention of the trade.

RUSSELLS

PARALLEL
TOOLS.

PATENT

HAGSTOZ & THORPE,

Sole Manufacturers and Proprietors.
Sixth and Chestnut Sts., Philadelphia, Pa.

Cutlery.

CORPORATE MARK,



Joseph Rodgers & Sons'

(LIMITED)

CELEBRATED CUTLERY,

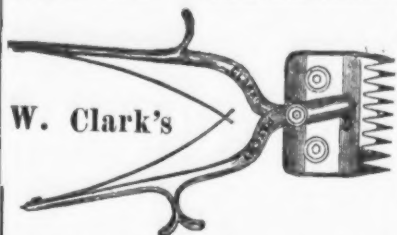
No. 52 Chambers Street, New York.

F. & W. CLATWORTHY, Agents.

The demand for Joseph Rodgers & Sons' productions having considerably increased, they have, in order to meet it, greatly extended their Manufacturing Premises and Steam power.

To distinguish Articles of Joseph Rodgers & Sons' Manufacture, please to see that they bear their Corporate Mark.

SHEEP SHEARS.

Simple in action. Fleece evenly shorn without
injuring the skin. Is held firmly in right hand and
easily operated. Also

CLARK'S HORSE CLIPPERS.

No. 1 for two hands; No. 2, one hand, for heads
and manes; No. 3, one hand, for legs and coarse
hair; No. 4, for two hands, with improved spring.
Send for price list.

McCOY & CO.,

SOLE AGENTS,

134 and 136 Duane Street, New York.

Cutlery.

JOSEPH S. FISHER,

No. 411 Commerce St., PHILADELPHIA

AGENT FOR

George Wostenholm & Son,

"Limited."

Washington Works, SHEFFIELD,

Celebrated I-XL Cutlery, Razors, &c

AGENT FOR

WALTER SPENCER & CO.,

Rotherham, ENGLAND.

Corporate Mark.

NO SPENCER
ROTHERHAM

Granted 1777.



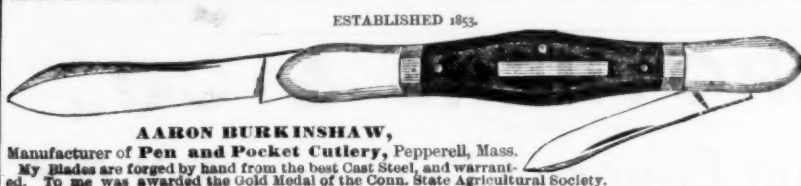
HERMANN BOKER & CO.,

101 & 103 Duane Street, New York,

SOLE AGENTS FOR THE

GARDNER PATENT
POCKET KNIVESThe assortment of Gardner's Celebrated
Barlow Knives has been increased, and they
are now furnished with Rubber, Bone, Stag
and Wrought Iron Handles.

All of Gardner's Patent Knives are fully warranted.



ESTABLISHED 1852.

NEW YORK KNIFE CO.

MANUFACTURERS OF SUPERIOR

Table & Pocket Cutlery,

WARRANTED TO BE MADE OF THE BEST
MATERIAL.

WALKILL RIVER WORKS,

Walden, Orange Co., New York.

THOS. J. BRADLEY, President.

TUCKER & DORSEY,

MANUFACTURERS.



SPECIALTY

COAL WASHING MACHINES AND
IMPROVED COKE OVENS.

S. DIESCHER,

Civil and Mechanical Engineer,

Cor. Smithfield St. & 6th Ave., Pittsburgh, Pa.

FISHER'S MOWING MACHINE
KNIFE CRINDER,SIZES EDGE RAY KNIVES, RAY FORKS, SEC-
TIONS, &c., &c.Sold by Hardware and Implement Dealers
everywhere. Illustrated Circular and
Quotations sent free.

HENRY FISHER, Canton, Ohio.

driven, is near the center of the building and
under the protection of its roof.—Iron Age
Journal.The Lake Erie Iron Company, Cleveland,
have occupied their fine new quarters in the
Schofield Block on St. Clair street.The Belfont and Lawrence mills, at Iron-
ton, were in full operation last week.The Monitor Furnace, at Ironton, will be
ready to blow in about the 1st of May. The
principal repairs to the furnace will consist
of a new stone hearth.A new Player's hot blast is being put
up at Ohio Furnace, Scioto county. The
work will not be completed until about June 1.The Girard Furnace is making about 55
tons of good iron per day.

The Diebold Safe Works, at Akron, are

making seven safes daily.

It is reported that the Valley Mill, at

Youngstown, will resume operations at an

early date.

The Excelsior Works, at Akron, still re-
main unsold owing to a lack of bidders.Mr. A. B. Stone, who has been identified
with the Cleveland Rolling Mill Company
from its earliest organization, and widely
and favorably known as its president, hav-
ing established his residence in New York,
has resigned the office of president and ac-
cepted that of vice-president, with the
charge of the New York agency of the com-
pany, and will hereafter devote his attention
more exclusively to the duties of such
agency. Mr. Henry Chisholm, who during
the same period has been the vice-president
and general manager of the company, suc-
ceeds Mr. Stone as president.

ILLINOIS.

A meeting of the stockholders of the
North Chicago Rolling Mill Company is
called for Thursday, April 4th, to take into
consideration arrangements already entered
into for "largely increasing the manufac-
turing capacity of the company by purchase
or lease of other works." The "other
works" are without doubt the Milwaukee
mills. Why the Chicago company desire to
gain possession of them is not so evident. It
may be that the large interest of the Ward
estate in both the Chicago and Milwaukee
mills has something to do with the matter.—
Wayne County Courier.The Chicago Galvanized Wire Fence Co.
is the style of a new corporation lately or-
ganized in Chicago with a capital of \$50,000.
The incorporators are E. M. Crandall, C. H.
Kakshorn and C. T. Mason.The Joseph Brown Iron Works, at South
Chicago, are now in full operation, except
the nail mill, which it is intended to start
about the 1st of May.

IOWA.

The Council Bluffs Iron Works are the
largest of the kind on the Missouri above
St. Louis. They were founded in 1860 by
Mr. C. Hendrie, the president of the present
company, who is emphatically a pioneer
worker in iron. He started the first foundry
in Burlington, Iowa, and for some years
carried on the works successfully. He then
disposed of the works there, and in 1860
started the Council Bluffs Iron Works, the
first foundry established there. In 1862 he
went to Colorado, and put up the first
foundry in that territory, at Central City.
That establishment is still in successful op-
eration, under the name of the Hendrie &
Bolthoff Manufacturing Company, and en-
gaged in the manufacture of mining ma-
chinery as a specialty. The Council Bluffs
Iron Works are an incorporated company
with a capital of \$75,000, of which Mr. C.
Hendrie is president and R. J. Cory sec-
retary and treasurer. The specialty of the
works is the manufacture of steam engines,
boilers, mining and general machinery, &c.,
The buildings are of brick; they are large and
commodious, and filled with all the requisite
machinery. They employ from fifty to sixty
hands, and, notwithstanding the dull times,
have run during the past year without once
shutting down.

NEBRASKA.

Omaha is talking about a nail mill which
shall secure its material for nail plate from
the old rails and scrap iron in that neigh-
borhood.The Von Dorn machine shops at Omaha,
T. L. Von Dorn, proprietor, were established
in 1873, on a limited capital, and have grown
into one of the most active concerns in the
city. Mr. Von Dorn manufactures steam
engines, lathes and general ironworking
machinery. He now employs fifteen to six-
teen hands, and has a well appointed shop,
supplied with all the necessary machinery of
the most improved make.G. Andrew, proprietor of the Omaha Safe
Works, commenced the manufacture of fire
and burglar proof safes, vault doors, &c.,
some two years since. He employs, when
running full force, ten to fifteen hands.
Fenwick's Foundry Works are running on
light and heavy castings with a force of five
to eight hands. The Clay Street Iron Works
employ fifteen to twenty hands on general
machinery and architectural ironwork. The
Nebraska Fence Works were busy with ten
to fifteen hands.

KENTUCKY.

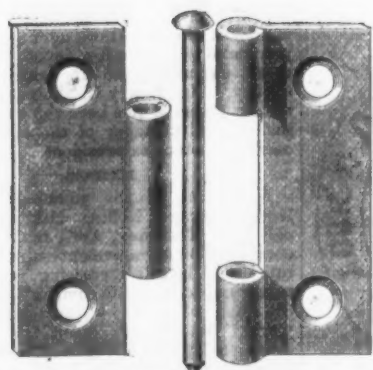
The Bellefonte Furnace blew out on the
11th of February, finishing a blast of 268
days, which she commenced on the 4th of
May, 1877. During this time she made 3066
tons of good, mostly No. 1 charcoal iron, or
a daily average of 11.44 tons. This product
was the result of smelting—124 bushels of charcoal at 4/8¢..... \$6.93
3 tons of iron ore at \$2.50..... 7.50A total cost of material of..... \$14.43
per ton of iron made. The average consump-
tion of cordwood per ton of iron represented
by the above 154 bushels of charcoal, was 3.63
cords of wood. At present this furnace has
on hand and unsold 4500 tons of pig iron,
and is cutting some 11,000 cords of wood,
preparing a blast for this season equal to
the last.—Greenup Independent.

MICHIGAN.

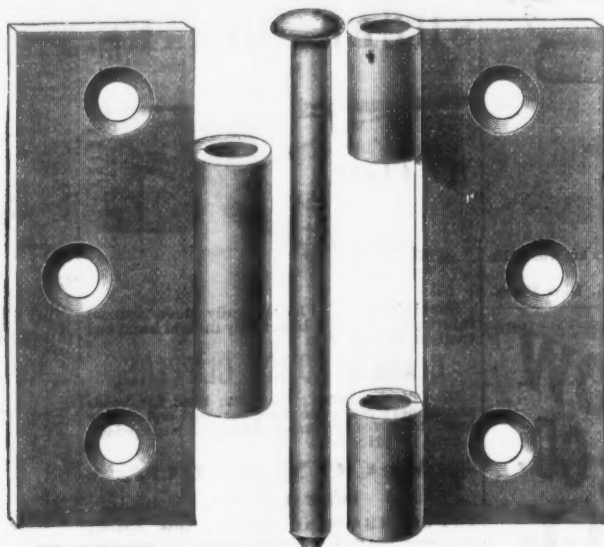
The new merchant mill of the Baugh
Manufacturing Company, at Springwells,
began work this week.The Eureka Iron Company, Detroit, are
repairing their blast furnace and will soon be
ready for business again. The engines and
machinery are in pieces and the old hearth
has been taken out. It will not be necessary
to relino the furnace.

THE STANLEY WORKS,

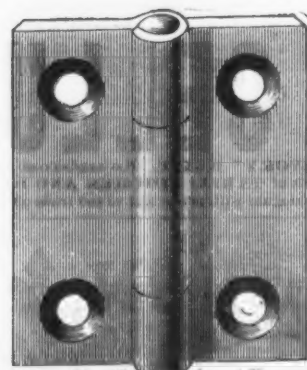
Manufacturers of
**WROUGHT IRON BUTTS AND HINGES, WROUGHT FLUSH
 AND DOOR BOLTS.**



Loose Pin Light Narrow Butt.



Wrought Reversible Butt.



Wrought Narrow Butt.

In addition to our own goods, we are prepared to furnish a **FULL LINE OF**
CROOKE & COMPANY'S Wrought Iron Bright Butts.

For our latest discounts, see Circular in *The Iron Age*, this date.

Factories, New Britain, Conn.

Warehouse, 79 Chambers Street, New York.

CLARK BROTHERS & CO.,

SOLE MANUFACTURERS OF:

Clark's Patent Concave Carriage Bolt.

Best Bolt manufactured for all kinds of Agricultural Machinery. Will not split the wood, and cannot turn in its place.

ALSO MANUFACTURERS OF



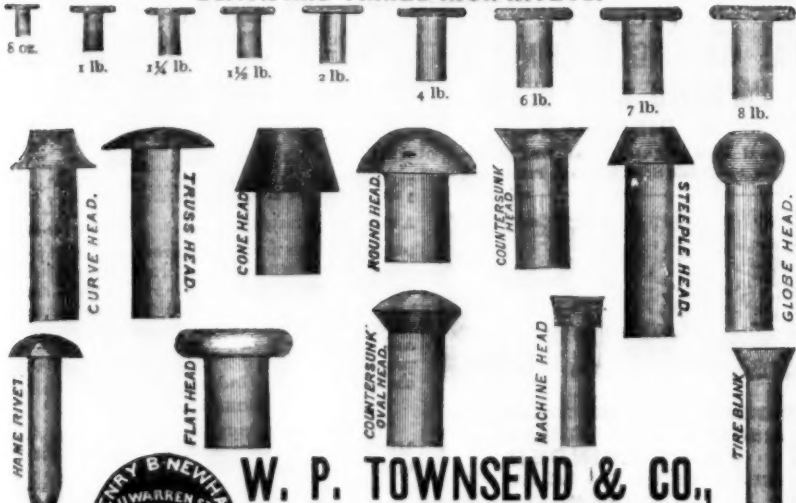
MILDALE, CONN.

HOLROYD & CO.,

Waterford, N. Y.



BLACK AND TINNED IRON RIVETS.



W. P. TOWNSEND & CO.,
 PITTSBURGH, PA.,

Manufacturers of every description of First Quality,

RIVETS.

Philadelphia "STAR" Bolt Works.

NORWAY IRON

FANCY HEAD BOLTS,

Carriage & Tire Bolts.

Star Axle Clips, &c.

TOWNSEND, WILSON & HUBBARD, 2301 Cherry St., Philadelphia, Pa.

HOOPES & TOWNSEND,

PHILADELPHIA, PA.,

MANUFACTURE

Machine & Car Bolts,

Tank and Coopers'

COLD PUNCHED

RIVETS,

Square and Hexagon

Bridge Rods and Bolts,

WOOD SCREWS,

Nuts, Washers,

Chain Links.

"Keystone" Boiler Rivets,
 Unequaled in Quality and Finish.

FORT PLAIN SPRING AND AXLE WORKS.



FOR SPRING TRADE.

All dealers in **SPRINGS AND AXLES** will find it to their interest to send to us for Price List and Discounts.

WOOD, SMITH & CO., Fort Plain, N. Y.

OLD COLONY RIVET WORKS,

KINGSTON, MASS.,

MANUFACTURERS OF

Rivets, Hand Iron Cutters, Punches, Shears, and Planing and Shaping Machines;
 Universal Ratchet Drills, and Patent Tinner's Snips.

New York Warehouse, 116 Chambers Street.



TURNED
MACHINE SCREWS.

One-sixteenth to five-eighths diameter.

Heads and points to sample.

IRON, STEEL AND BRASS.

Lyon & Fellows Mfg. Co.,

Cor. 1st and North 3d Streets, Williamsburgh, N. Y.

H. D. SMITH & CO.,

Plantville, Conn.,

Manufacturers of the

BEST QUALITY CARRIAGE MAKERS' HARDWARE.

Manufacture the Largest Variety of Forged Carriage Irons of Best Material and Workmanship.

PRICES LOW FOR QUALITY OF WORK FURNISHED.

SEND FOR PRICE LIST.

NEW EXCELSIOR LAWN MOWER

Received the Highest Award at the Centennial Exposition.

IMPORTANT FEATURES FOR THE SEASON OF 1878.



Reduction in Price.

LESS WEIGHT.

LIGHTER DRAFT.

And furnished with either Wheels or Roller.

It has been adopted and can be seen in practical operation on the Public Parks of New York, Brooklyn, Boston, New Haven, Cleveland, Chicago, and on almost all the prominent City Parks in the UNITED STATES and CANADA.

The EXCELSIOR received the First Premiums at the Great Lawn Mower Trials held in New York City, Cleveland, O., Waverly, N. J.; also at the Great International Lawn Mower Trial held at Carlisle, England, in September last, and at many other trials and Agricultural Fairs held in Europe and America.

6 SIZES FOR HAND POWER.

4 SIZES FOR HORSE POWER.

Our New Horse Mower is conceded to be the LIGHTEST and BEST Horse Lawn Mower ever made.

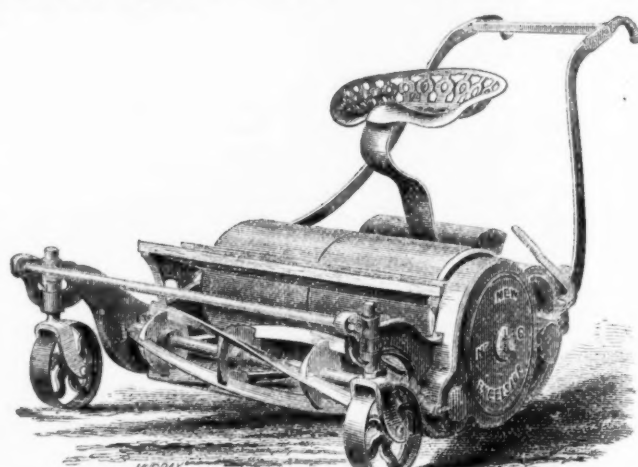
N. B. Horse and Hand Lawn Mowers are alike guaranteed in every respect.

ADDRESS,

CHADBORN & COLDWELL MFG. CO.,

Send for Circular.

Newburgh, N. Y.



LEWIS, OLIVER & PHILLIPS,

PITTSBURGH, PA.,

MANUFACTURERS OF

Heavy and Wagon Hardware, BOLTS AND NUTS

OF ALL KINDS,

Screw Hooks and Strap and T Hinges,

Etc., Etc



Send for lithographs and price lists.

Philadelphia Screw Co.,

MANUFACTURERS OF

Iron and Brass

WOOD SCREWS

Of Every Description.

OFFICE AND FACTORY,

N. W. Cor. 12th & Buttonwood Streets, Philadelphia, Pa.

Complete assortment at lowest market rates.

The only GENUINE D. R. BARTON Tools

ARE MADE BY

THE D. R. BARTON TOOL CO.,

Cor. Mill and Furnace Streets,

ROCHESTER, N. Y.

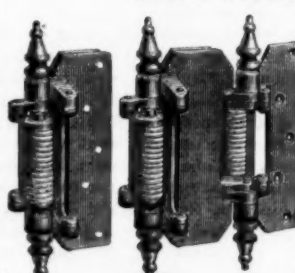
AGENCIES:

HEATON & DENCKLA, 507 Commerce Street, Philadelphia, Pa.
H. O. STRATTON, 33 Oliver Street, Boston, Mass.
HUNTINGTON, HOPKINS & CO., Sacramento.
NATHAN WEED, 4 Gold Street, New York.

The Cowles Hardware Co., Unionville, Conn.,

MANUFACTURERS OF

Geer's Double and Single Action Spring Butts.



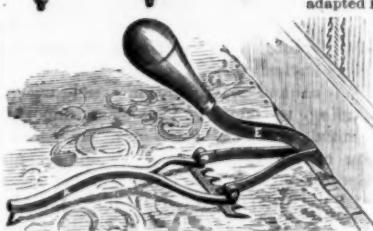
Reverse in action and radically different from any other in market. Patented July 17, 1877. The accompanying cut shows our Double Action Spring Butts for swinging doors both ways. We claim the following points of superiority: First—These Butts differ from all others in principle and action, combining the Toggle Arm with the Spring Spring, which by actual test gives out from 50 to 80 per cent. more force at the closing point than when opened to a right angle, thus holding the door firmly in place, and not allowing it to be moved by currents of air. Second—They will allow the door to be opened clear back to the wall, and the spring retains it there; thus the toggle and spring fill two important offices—that of holding the door closed and also open. Third—It is impossible to strain the spring, as there is not more than 60 per cent. of the elasticity of it used in swinging the door back to the wall, therefore it will not become weak from constant use. Fourth—The bearings are all faced with hardened steel, which is much superior to common cast iron or brass, both in regard to friction and durability. Fifth—They will hold the door firmly up to its place on the top, and not allow it to open off, thus obviating all tendency to sag. Sixth—These Butts are so constructed that there is no right or left hand. When adjusted to the door they never need taking up or letting out, as they are perfectly adapted for either summer or winter, without any change whatever.

HERCULES

Reverse Action Door Spring and Retainer.

(Patented March 4, 1875.)

On an entirely new principle, distinct from all others. Holds the door open as well as shut, and allows the door to stand at a right angle without the aid of any catch.



BULLARD'S PAT. CARPET STRETCHER.

Patented June 13th, 1876.

The best thing ever made for laying carpets. It is light, simple in construction, durable and not expensive, is very easy to operate, and is warranted not to injure the finest carpet. It holds the carpet in position after it is drawn to its proper place, thus giving the operator the free use of both hands with which to do the nailing. The lever, E, is then folded back and down upon the push bar, A, so it will be entirely out of the way while the carpet is being nailed. No person using one once will be without one. It needs only to be seen to be appreciated. For utility it defies competition. Also manufacturers of Awls, Bung Starts, Butter Saws, Bill Hooks, Brush Hooks, Butts (Double Spring and Single Spring), Border Knives, Box Openers, Box Hooks, Box Scrapers, Cleavers (Cast Steel), Cake Turners, Corn Hooks, Cover Lifters, Cold Chisels, Carriage Jacks, Carpet Stretchers (Bullard's and Common), Door Springs (Hercules and Air Cushion), Fish Turners, Ferrules (Brass), Handles, Hammers (Magnetic Tack, Steel, Steel Tack and Iron Tack), Hoes (Shuffle), Ice Axes (Iron), Ice Axes (Lignum vitae, Iron Heads and Maple H'dle), Ice Tongs, House Traps (Pat. Automatic), Miners (Cast Steel and Hammered), Nail Sets, Nail Cracks, Punches (Round), Screw Drivers (Sawing Machine, Lock Styles, Bit Brace and Implement), Trowels (Garden), Tack Claws, Vegetable Slicers.

Send for price lists and discounts.



Tubular Bow Sockets.

Side Spring Connecting Rods.

A X E S

BEST BRANDS SOLD.

X BULLION, A

\$5.50 per doz.

E LIPPINCOTT'S, X

\$9 per doz.

S DIAMOND, E

\$8 per doz. Cash, 30 days.

A X E S

Made in PITTSBURGH by

HUBBARD, BAKWELL & CO.

Sold by

Everyone who keeps good Hardware.

PATENT CONVEX

Fluting & Smoothing Iron.



1st. It can be used as an ordinary Smoothing iron; 2d. It is a Fluting Machine as well as a Smoothing Iron. 3d. The Fluting Attachment being made of brass, and convex in form, it has all the advantages of the crank machine. 4th. It combines the two articles in one, taking up the room of but one machine, and is always ready for use.

A. A. WEEKS, Manufacturer,
No. 82 John Street New York.

Corey's Patent

Elastic Expansion

RUBBER

BUCKET

For Chain Pumps.

The Best in Use.

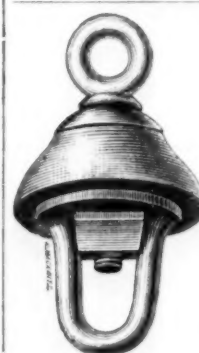
Patented March 16, 1875.

Sizes of Bucket,

1 1/2, 2 1/2, 3 1/2, 4 inch.

A. L. COREY,

Ypsilanti, Mich.



The Iron Age.

New York, Thursday, March 21, 1878.

DAVID WILLIAMS, Publisher and Proprietor.
JAMES C. BAYLES, Editor.
JOHN S. KING, Business Manager.

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The publishers of *The Ironmonger*, 44a Cannon street, London, England, will receive orders for subscriptions and advertisements on our regular terms.

AUSTRALIAN AGENCY.

The American Hardware Company, Melbourne, are our agents for Australia. Sample copies will be mailed by them, free of charge, to any firm engaged in the trades we represent in Australia, Tasmania and New Zealand.

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Twenty-fourth Page.—Scientific and Technical Notes. Protecting a Foreign Trade Mark. The English Rail Exports.
Twenty-sixth Page.—New York Wholesale Prices. (Continued.)
Thirty-third Page.—Philadelphia, Buffalo, Chicago and Pittsburgh Hardware and Metal Prices.
Thirty-fifth Page.—Boston and St. Louis Hardware and Metal Prices.

The portrait and sketch of the late Henry Diston, which we print on the first page of this issue, is our tribute to the memory of a man who deserves an honorable place in our national annals. Though not of American birth, Mr. Diston was a representative American manufacturer, and during his long and useful life did much to make it possible for other manufacturers to win peaceful industrial triumphs in international competition. Although he never aspired to public life, he was in his sphere a man of controlling influence, and the story of his life contains a lesson which every intelligent and ambitious young mechanic might study with profit. Mr. Diston began life by learning a trade—not as most boys learn trades, in a perfunctory, half-hearted way, but with a determination to

master it thoroughly. Beginning at 14, he rose at 18, while still in his apprenticeship, to the position of foreman of his employer's shop. He afterward began business for himself as a young man should—in a small way, depending upon himself and his own skill, until he needed more help and was justified in becoming an employer. Probably the secret of his success in early life was that he was not afraid of work, and found no pleasure in neglecting it for recreation. To the man of healthy body and well-balanced mind, work should be a pleasure when directed to the attainment of some definite and desirable result, and so Henry Diston found it. His life work absorbed his attention and concentrated his thoughts, and in its results he found worthy satisfaction. Success equally honorable, if not equally great, can be attained by any mechanic who will seek it by the same means.

Spain's Trade with Europe and America.

Although still in possession of some very rich colonies, the general trade of peninsular Spain has gradually dwindled down to a comparatively small figure, as the following statistics will show:

Imports.	Exports.	Total.
1875. Great Britain.....	3,377,95	14,99,86
1875. Germany.....	1,481,78	741,92
1875. France.....	580,10	580,10
1875. Russia in Europe.....	481,40	481,40
1875. Austria.....	580,10	580,10
1875. Holland.....	580,10	580,10
1875. Belgium.....	454,58	454,58
1875. Italy.....	357,00	357,00

Since 1874 Spanish imports have varied between \$100,000,000 and \$120,000,000 per annum, and the export between \$60,000,000 and \$80,000,000. In this movement the various European nations are represented in about the following proportion:

Imports.	Exports.	Total.
France.....	\$42,000,000	\$14,000,000
England.....	26,000,000	33,000,000
Scandinavia.....	2,500,000	400,000
Turkey.....	2,400,000	2,400,000
Italy.....	1,200,000	800,000
Portugal.....	800,000	2,500,000
Gibraltar.....	1,200,000	600,000

Total.....\$76,200,000 \$50,400,000 \$126,600,000

France being the next door neighbor of Spain, only separated from the latter by the Pyrenees, now traversed by a railroad, and Marseilles from time immemorial having done a large trade with Mediterranean Spain by sea, the business relations between the two countries have always been most important. An examination of the classes of goods exchanged between the two nations will, consequently, procure us an insight into the chief necessities of Spain from a commercial point of view.

SPAIN'S TRADE WITH FRANCE IN 1875.

Imports.	Exports.	Total.
Woolens.....	\$3,304,949	1,999,800
Millinery.....	1,999,800	2,153,000
Horses and mules.....	610,200	1,071,400
Cotton.....	1,071,400	1,443,200
Cotton goods.....	1,443,200	636,600
Silk goods.....	636,600	974,400
Leather.....	974,400	719,200
Hardware, &c.....	719,200	1,550,500
Hides.....	1,550,500	735,600
Cattle.....	735,600	925,400
Wool.....	925,400	344,400
Paper board.....	344,400	508,000
Jewelry.....	508,000	298,800
Imitation jewelry.....	298,800	404,800
Lumber.....	404,800	454,300
Iron and steel.....	454,300	423,600
Glassware and china.....	423,600	1,080,400
Refined sugar.....	1,080,400	629,200
Machinery.....	629,200	420,400
Furniture.....	420,400	380,200

Total.....\$20,393,549

Principal Exports from Spain.

Imports.	Exports.	Total.
Lead.....	\$3,000,000	2,884,000
Table fruit.....	2,884,000	500,000
Olives.....	500,000	1,425,000
Wine.....	1,425,000	1,550,500
Wool.....	1,550,500	900,000
Hides.....	900,000	962,000
Cochineal.....	962,000	792,000
Silk.....	792,000	247,800
Speller.....	247,800	663,800
Iron ore.....	663,800	540,000
Cattle.....	540,000	474,200
Olive oil.....	474,200	514,200
Grain.....	514,200	

Total.....\$15,777,500

The following shows Spain's trade with France from 1867 to 1875:

Imports.	Exports.	Total.
1867.....	\$20,600,000	\$3,800,000
1868.....	21,700,000	39,320,000
1869.....	19,340,000	40,060,000
1870.....	18,200,000	33,000,000
1871.....	20,320,000	41,540,000
1872.....	22,550,000	35,950,000
1873.....	22,020,000	50,220,000
1874.....	27,831,200	53,819,900
1875.....	28,114,800	58,283,141

Total.....\$200,745,000 \$186,053,121 \$386,798,121

While the Carlist rebellion lasted the commercial intercourse between the north of Spain and the south of France suffered very much, but trade is rapidly recovering. England being next in importance in Spanish foreign trade, it will be of interest to examine what Spain has drawn from that country of iron, steel and their manufactures during the past two years:

EXPORT FROM ENGLAND TO SPAIN AND THE CANARY ISLANDS.

Imports.	Exports.	Total.
1876.....	\$592,697	\$525,264
1877.....	422,825	344,977
Cast and wrought iron.....	473,307	346,813
Steam engines.....	427,696	459,039
Machinery.....	1,386,454	1,458,725
Iron rails.....	364,416	208,948
Steel.....	267,539	486,342

Total.....\$3,956,864 \$3,831,002

In 1875 there were imported from England into Spain, steam engines to the amount of \$360,917, and other machinery worth \$1,161,287, and, as we have shown above, machinery from France in the same year, \$420,400, constituting a total of \$1,942,604.

Spain is a nation which not only possesses the greatest and most varied mineralogical resources of any in Europe, but she has a most extensive cotton and leather industry in Catalonia. She is, therefore, a great consumer of machinery for mining purposes, as well as for the spinning and weaving of cot-

ton, wool and other textiles; hence this extensive importation of machinery.

After casting a glance at the European trade of Spain, we shall be all the better prepared to judge of our own dealings with the Peninsula.

TRADE BETWEEN THE UNITED STATES AND SPAIN.

Fiscal years.	Our Imports.	Domestic Exports.	Foreign Exports.	Total.
1864.....	2,188	2,654	815	5,657
1865.....	2,055	4,036	13	6,104
1866.....	2,785	5,719	13	8,517
1867.....	3,051	5,507	70	8,628
1868.....	2,879	7,640	23	10,542
1869.....	3,558	7,596	31	11,185
1870.....	3,598	7,596	31	11,225
1871.....	4,188	10,248	34	14,470
1872.....	4,426	9,446	31	13,893
1873.....	4,962	10,057	27	15,046
1874.....	4,598	11,044	9	15,651
1875.....	4,535	7,540	2	12,077
1876.....	3,401	10,138	9	13,548
1877.....	3,281	10,462	12	13,755

Grand total.....48,485 113,437 1,067 162,989

It will be observed that our general trade with Spain has very nearly doubled since the war, and that during the 14 years above enumerated our export has been more than twice as large as our import. This is chiefly due to the increased amounts of cotton and petroleum which that country takes from us.

The following shows the principal articles of domestic production which we have exported to Spain during the fiscal year ended June 30, 1877:

Imports.	Exports.	Total.
Billiard tables.....	\$1,000	48,478
Indian Corn.....	70,344	70,344
Wheat.....	3,668	3,668
Other cereals.....	17,201	17,201
Farina.....	5,594,948	5,594,948
Cotton.....	5,474	5,474
Drugs.....	2,124	2,124
Glassware.....	1,800	1,800
Jewelry.....	5,811	5,811
Machinery.....	38,794	38,794
Rosin.....	301,169	301,169
Crude Petroleum.....	3,855	3,855
Naphtha.....	2,397,184	2,397,184
Refined Petroleum.....	25,783	25,783
Residuum.....	123,906	123,906
Cottonseed oil.....	1,925	1,925
Perfumery.....	82,048	82,048
Bacon.....	16,481	16,481
Lard.....	1,027	1,027
Scales.....	19,450	19,450
Whiskey.....	22,468	22,468
Tallow.....	866,650	866,650
Leaf tobacco.....	2,000	2,000
Manufactured tobacco.....	7,011	7,011
Wax.....	102,185	102,185
Lumber.....	537,358	537,358
Shooks, &c.....	6,627	6,627
Timber.....	1,134	1,134
Woodenware.....	9,869	9,869
Other goods.....		

Total.....\$10,461,750

The Spanish merchant navy now numbers 274 sailing vessels with a tonnage of 539,533, and 224 steamers with a capacity of 176,310 tons; together, 298 vessels with an aggregate tonnage of 706,843. Of railroads in operation there are 3594 miles, the population being 17,114,200; there are, consequently, 21 miles to every 100,000 inhabitants. Spain had in 1875 some 2358 post offices, distributing during the year 4.8 letters per capita of the population, and 4.8 newspapers, circulars and samples.

Spain possesses all the elements for a rapid recuperation of national and individual prosperity, but will require, in order to be able to rise again, at least 20 years of profound peace at home and abroad. Her population is sober and industrious, and under an energetic, intelligent and economical government, in the possession of the splendid provinces of Cuba, the Philippine Islands and Porto Rico, she may soon rank on a par once more in power and importance with the remaining Latin nations.

Spain is doubly interesting to us on account of the enormous trade we are doing with her colonies, whose prosperity is largely bound up with her own. The wants and preferences of the people of Spain are, in a measure, known to us from what we see of the Spaniards in Cuba and Porto Rico, and it ought to be an easy matter for us to compete in Spain with England and France in many articles, machinery, hardware and cutlery among others, all of which her colonies take from us in increasing quantities, while we have surrendered the mother country therein to the European manufacturers exclusively.

We cannot conclude this article without alluding to one of the most important political events of the times, the pacification of Cuba, now from all appearances happily consummated. While doing so we refer to our article of November 15, 1877, "The importance of our Cuban trade," in which we foreshadowed the enlivening effect which peace in Cuba would have on our business relations with the island. We there showed that we exported to Cuba in the fiscal year ended June 30, 1876, \$14,000,000 of domestic goods, and \$2,000,000 of foreign goods, while we imported \$59,000,000 of Cuban produce. During the fiscal year 1877 we exported to the island \$13,000,000 of domestic and \$1,000,000 foreign goods, and imported thence the large amount of \$68,000,000 of colonial produce, the increase resulting from the rise in sugar and molasses.

The planters of Cuba will now once more deserve and enjoy credit, and our machine shops during the next five years will be busily engaged in building sugar machinery for the destroyed estates; railroads will be rebuilt and extended, and our business connections with Spain and her colonies will become more active and valuable than they have been previous to, or during, the past 10 years of Spanish political convulsions.

Mr. Edison, the inventor of electrical marvels of various kinds, has lately perfected a device which, if all we hear about it is true, will possess unique utility. It is called the *areophone*, and its function is that, "placed upon a locomotive, it will raise its voice when desired and announce in giant tones, that can be heard for miles, 'I am

engine Marmaduke, and will stop at Boon-ton Station,' or whatever other warning 'or information it chooses.' We can see at a glance the extent to which this device will increase the comfort and satisfaction of railway travel. For example, the warning now conveyed to people or cattle on the track by the steam whistle of an approaching engine, can be effectively supplemented by a few forcible remarks from the *areophone*; and when, in the event of any unusual stoppage, the passengers shall poke their heads out of the car windows, anxious for information as to what it is all about, the engineer can win gratitude from nervous people by inciting the *areophone* to remark, in "giant" tones, "It's all right, gentlemen; nothing but a—cow on the track." During the season of pleasure travel the *areophone* might be further utilized by calling out the names of stations (we hope its enunciation will be more distinct than that of the average brakeman) and expatiating upon the beauties of the scenery, or calling attention to the historical incidents rendering the localities noteworthy. For example, a Hudson River engine provided with an *areophone* could repeat whole chapters of Lossing's "Field Book of the Revolution," interspersed with choice extracts from the letter press of "Picturesque America." Indeed it is a wonderful invention. We have but one fear concerning it, and that is that from constant association with railroad men the *areophone* will acquire certain loose habits of thought and speech which will lead it to indiscreet utterances upon sufficient provocation. Unless Mr. Edison can insure the public against being shocked by *areophonic* profanity, delivered "in giant tones that can be heard for miles around," we shall never feel that ladies and young persons are quite safe in its company.

The Mobilization of Labor.

We refer again to the prospect of labor agitations in this country, as it is one of the most vital questions now agitating our people. Finance and tariff may for the present seem to overshadow all other questions, and those interested may solace themselves with the belief that the agitation of these will postpone the struggle that is sure to come; but a moment's investigation will show that these questions have no meaning nor interest to hundreds of thousands who are showing the utmost concern in them, except so far as they have a bearing on the rate of wages and the employment of idle labor. Underlying the deep interest in all these questions is the labor problem, and it is only as steps in the solution of this (to them) most important question, that they stop to discuss or consider finance or tariff.

And it may as well be admitted that these men are not groping after an issue. They have one, distinct and well defined, and they also have a way by which they mean to reach the object they are seeking. The aim is to control labor and its wages—the means, consolidation or mobilization of all laborers. This is the dream of the labor agitators. To its realization these men are giving the most positive and intelligent efforts of their lives. The leaders in the movement are organizers of no common or inferior kind, but know how to control men, to unite them and to organize them. They are determined to succeed, because they believe that the only way to reach the ends they have been aiming at is by such united effort as we have suggested.

There is another phase of this impending struggle that it is well to consider. These men propose not only to control themselves and their fellow laborers and prevent working under price by wage laborers, but they propose to prevent manufacturers from selling under price. It is no secret that during the past year certain manufacturers of iron needed only to drop a hint, and not a ton of iron could have been made in certain mills that did not sustain prices fixed by associations. To-day the unions will engage to compel the adherence to any price that may be named as a fair rate. We do not mention this to approve any such course, but to indicate what ideas are working in the minds of the laboring men of the country, and which it is folly to ignore or to shut one's eyes like a little child and say we don't believe it is there.

This is no idle talk. Strenuous efforts are making to form an organization called the "International Labor Union of America." This organization has for its object confessedly the propagation of trades unionism where now it does not, or only partially, exist, the strengthening of the present organizations and the mobilization of the whole—claiming, in the words of one of its advocates, that "with the united support it should enlist, workingmen will have the reins of impartial justice in their own hands, and will be enabled to secure satisfaction to themselves by proper regulations of labor, and eventually to employers, by giving them the advantage of uniformity of market prices, &c., and thus 'protect them against themselves.' We ask especial attention to this last clause, as it expressly states the purpose we have indicated above. The method is not so plainly stated as we have stated it, but the intent is evident.

The statement of principles of this organization, as put forth, embraces the following points among others:

We, therefore, believing that the emancipation of labor can only be achieved by the organization of the laborers into a great protective propaganda of the principles enunciated in the foregoing declaration of principles, and in response to a demand made upon us by various labor organizations and wage-workers in all parts of the United States, severally agree to form ourselves into a committee known as the Central Provisional Committee of the International Labor Union, whose objects shall be to secure the following measures:

1. The reduction of the hours of labor.
2. Higher wages.
3. Factory, mine and workshop inspection.
4. Abolition of the contract convict labor and truck systems.
5. Employers to be held responsible for accidents by neglected machinery.
6. Prohibition of child labor.
7. The establishment of labor bureaus.
8. Labor propaganda by means of a labor press, labor lectures, the employment of a general organizer and the final abolition of the wage system.
9. The methods by which we propose to secure these measures are:

1. The formation of an amalgamated union of laborers, so that members of any craft can combine under a central head and form a part of the amalgamated trades unions.
2. The establishment of a general fund for benefit and protective purposes.
3. The organization of all workmen in their trade unions, and the creation of such unions where none exist.
4. The national and international amalgamation of all labor unions.

It will be interesting to watch the development of this movement. It shares with all such undertakings the danger of passing into bad hands and being diverted from its original intent for partisan purposes. If it escapes this, it may be potent to accomplish great and permanent changes in our social and industrial system which will be of immediate and permanent benefit.

Official Tests of Steam Boilers.

inspectors, shows nothing save that the boiler is or is not tight at a certain pressure. Not only is this test useless in obtaining any information of value, but it may be a source of serious injury to the boiler—injury which is not usually discoverable at the time. It has been shown by careful experiment that a boiler may explode violently at a pressure below that of the hydrostatic test. A case of this kind happened at the government tests, the explosion taking place only a day or two after the test was made. Scale, laminated sheets, crystallized iron, grooved plates, broken braces, pitting, corrosion and blisters are dangers for which the most careful examination must be made. When we are assured that none of these defects exist, that the boiler is perfect in shape, that safety valves and fittings are in order, we know to a certainty that the boiler is safe. To compel boiler owners to submit their boilers to an injurious test, obliging them to pay for it, and at the same time giving them no assurance that the boiler is safe, is a wrong against which the strongest measures should be taken. The aim of municipal and government inspection is to detect unsafe steam boilers. It should make no difference what the test is so long as perfect assurance is given of safety. This cannot be done by the hydrostatic test. Inspection, or the hammer test as it is called, can give this perfect assurance of the condition of the boiler. This is proved by the experience of the Hartford Steam Boiler Insurance Company in all parts of the country. On the other hand, the uselessness of the hydrostatic test is demonstrated by almost every explosion.

Contrary to the predictions and positive proof, on paper, gold has declined materially since the passage of the silver bill, and in the same time bonds have advanced in London. Gold has touched $\frac{1}{4}$ of 1 per cent., a drop of over 1 per cent. in 12 days, or more than 50 per cent. of the premium at which it stood when the silver bill became a law. This is so unexpected, so contrary to all principles of political economy, that our financial prophets are seemingly lost; but they will doubtless solace themselves with the reflection that they are all right. Isn't a principle a principle? Can it change? Certainly not. To be sure it is unaccountable that gold should be so perverse as not to go up as it ought, but they are all right.

Seriously, however, this fact shows how utterly impossible it is to determine beforehand what will be the result of any scheme, even though it may be in direct opposition to the best established laws of political economy. So many circumstances may come in to modify its action that it is impossible to foretell what the result will be. It was so in this case. Gold is abundant. The New York banks report a specie reserve of \$37,000,000, an amount never exceeded since the suspension. The demand for payment of duties will be less than heretofore by reason of the use of silver for the same purpose. The balance of trade remaining in our favor will continue to make gold abundant. The future of gold is mainly a question of foreign trade. There is not much probability of bonds continuing to return as long as their price in London bears the relation to the price in New York it does now, and as that there is every reason to believe it will continue to do. As we write we see a Washington dispatch which states that advice received by the Treasury Department from New York indicate an early demand for American securities. European complications have seriously impaired the standing of foreign securities, and the disposition for home investment is growing with capitalists who have surplus funds to invest, even in the face of recent legislation and pending the agitation of the financial question. Negotiations are now in progress with a view to the renewal of subscriptions by the syndicate.

Rapid Work in Railroad Bridge Building.

The completion on Tuesday, March 12, of the temporary bridge over the Raritan road, at New Brunswick, to replace the one destroyed by fire the previous Saturday morning, was a remarkable feat. At 7 o'clock on Saturday morning the old bridge was in ashes. At 10 minutes past 2 o'clock the following Wednesday afternoon an enormous train passed in safety over the new one. And this notwithstanding the fact that there was not on the ground at dusk on Saturday evening enough timber to make a dog kennel; that unprecedentedly high tides interfered greatly with the work; that during one day little could be done by reason of the rain, and that a furious storm stopped everything one whole night. Practically this immense structure, 1050 feet in length and from 35 to 49 feet in height, was completed in less than 100 hours of actual working time.

While the old bridge was blazing, telegraphic orders were summoning carpenters from all along the middle, Philadelphia and New York divisions of the road. Contractors in Newark and Jersey City were drawn upon for a force of laborers. When the men, and the lumber for them to work upon, reached the ground on Saturday evening, it was arranged that the men from the Pennsylvania divisions of the road should build out half of the new bridge from the southern end, and the New York division the northern half, meeting in the river. In point of numbers the Pennsylvanians were at a disadvantage, but they had a wealth of experience in just this kind of work that stood them in good stead, and they were all skilled carpenters. The Jersey men, as those working on the north end called themselves, numbered from 150 to 250, against the others 75 to 100, but many of them were

simply laborers, furnished by contractors, and of course neither skilled nor particularly anxious to expedite matters.

In some way, however, a spirit of keen emulation sprang up between the two parties. It did not seem to the Jersey men that the Pennsylvanians were doing much on Saturday night and Sunday morning, and they were looked upon as an easy lot to beat; but the error of that expectation was soon shown when the boys from the Keystone State got to work. They had been making preparations for the employment of mechanical forces instead of manual labor. The result was that when they really commenced work, 12 men did all their framing, six handled all the timbers, 15—aided by powerful "crabs" to do their hoisting—placed the completed bents in position, and the remainder of their force was employed in driving bolts, spiking on braces, placing stringers and ties, &c., so as to use each man to the best possible advantage. The Jersey men had no other hoisting apparatus than block and tackle; each timber was handled by 20 or more men, and had to be carried long distances through deep mud, from the framing ground down to where it was to be employed.

The Bituminous, Anthracite and Cannel Coal Fields of the Virginias.

To the Editor of the Iron Age—DEAR SIR: I respectfully submit herewith a brief description of some of the most prominent points of the immense coal measures of the two Virginias which came under my observation during a recent visit to that region, including principally those lying in Rockingham, Augusta, Fayette and Pendleton counties, along the line of the Chesapeake and Ohio Railroad, and also some remarks upon those lying in the northeastern counties of West Virginia. It is needless to add much to what has been already published in a general way relative to the great coal deposits of the Kanawha Valley and its tributaries; hence I will confine my remarks principally to the more recent developments made in certain localities, with some reliable analyses of the same.

The best-known authorities agree that the Appalachian chain, or Cumberland coal fields, contains the largest carboniferous deposits on the American continent. It is estimated that West Virginia alone contains over 16,000 square miles of coal lands, principally bituminous, cannel and gas coals. These measures are remarkable for their depth in vertical section and the variety and excellence of the deposits. Besides the coals of West Virginia, there are immense deposits east of the dividing line between the two States, lying in the eastern slopes of the Shenandoah (or Great North) Mountain, and in both sides of the ridges lying east of this mountain to the western border of the great valley of Virginia, including the Little North (or Narrow Back) Mountain, as defined upon Hotchkiss' map of Rockingham and Augusta counties. Eastward from the Kentucky State line and along the line of the Chesapeake and Ohio Railroad to the Blue Ridge in the valley of Virginia, the immense beds of very superior bituminous coking coals, cannel and other gas coals and anthracite of Rockingham and Augusta counties, lying in close proximity to millions of tons of iron ores and limestone of excellent quality, mark the site of the future most important iron manufacturing districts in the world.

The Chesapeake and Ohio Railroad, going west, enters the first outcrop of the bituminous coal field near the junction of New River and Meadow Creek, a few miles west of Hinton, and skirts the New and Kanawha valleys (the coal seams are traced on either slope to a point near Coalsmouth or St. Albans, 103 miles west of Hinton and about 43 miles beyond St. Albans to the Kentucky State line, along the northern boundary of North River, Guyandotte and Big Sandy coal fields), and as feeders to this road some 400 miles of branch tracks can be made at very moderate cost up the Gauley and Elk rivers. The slopes and side drainage of this field are very favorable for coal inclines, making the cost of mining and delivery very low. Nature has here sunk the pits and shafts, which never need repairs. The law of gravity has provided against the necessity for pumps or other costly machinery and for the perfect ventilation of the mines without any resort whatever to artificial means, being the result of the natural position of the coal strata. The facilities here for opening a slope (the mining fixtures consisting simply of side tracks, inclines and tipples) are exceedingly easy. Mr. Howell Fisher, of Pennsylvania, in 1873, said in respect to the conditions most favorable for mining, "This region stands unrivaled."

Bituminous coal beds are reached soon after crossing the Allegheny Mountains going west, along the waters of the Cheat and Greenbrier rivers, in Preston, Tucker, Randolph, Pocahontas, Greenbrier, Marion and other counties drained by the New and Gauley rivers. These being the lowest group, outcroppings of which may be seen on the geological map of the Virginias, drawn by Prof. Wm. B. Rogers to illustrate the Virginia State survey of 1835 and 1841, meet the great Pittsburgh seam. These coals reach the Eastern seaboard via the Baltimore and Ohio Railroad. I am informed that as much as 70,000 tons of these coals are shipped annually over the heavy grades of land, hill and the main Allegheny range over this road—including the famous Fairmont coal of Marion county, which is held in such high esteem in Eastern cities on account of its gas-producing qualities.

A new railroad is laid out and chartered to extend from Fredericksburg (on tide water) to the coal fields of the northeast counties of West Virginia, via Harrisburg, at which point connection will be made with the Valley branch of the Baltimore and Ohio Railroad, east, and south to Staunton; then connecting with the Chesapeake and Ohio Railroad. This road when finished will add much toward cheapening the transportation of these coals East, South and West. A large number of mines are being vigorously worked along the line of the Chesapeake and Ohio Railroad in the New River region, and delivered over inclines, many of which are long and very steep, to the bottoms of the hills, when they are caked and shipped in large quantities East and West. This New

River coal is well known for its excellent caking qualities. There are on the Laurel River eight seams marked by the outcrop, averaging about 21 feet of coal; this is called the Quinimont section. These seams thicken as they leave the river; for instance, the 4 feet vein opened at Quinimont, is increased in thickness to over 5 feet at the distance of four miles up the Laurel Creek. At Lowell there are eight seams with an aggregate thickness of 22 feet, and at Hawks Nest there are seven seams with 44 feet aggregate thickness.

The New River coals are ranked first-class for furnaces and cupolas, one-half ton of coke being the usual amount used (with raw ores) to the ton of iron; the coal from which this coke is made is exceedingly pure, as the following analysis will show:

	COALS.				
	Carb.	Vol.	Ash.	Sul.	Water.
Nuttallburg Mine.	69.00	29.59	1.07	0.78	0.34
Lowell Mine.	72.18	21.36	5.07	0.29	1.01
Quinimont Mine.	75.83	18.19	4.68	0.30	0.94
N. W. River Coal & C. Co's min's.	71.33	22.53	4.33	0.60	0.81

THE ANTHRACITE COAL FIELDS

of Rockingham and Augusta counties are situated along the eastern ranges of the Shenandoah (or Great North) Mountain, bounded on the east by Little North (or Narrow Back) Mountain, and on the west by the Shenandoah Mountain, both of which are members of the great Appalachian range, which extends southerly from New York through Pennsylvania and Virginia and into Alabama. The Dora anthracite coal basin is from three-quarters to one mile in width across the strike or course of the mines, and extends from a point seven miles south of North River Gap, westwardly 25 miles or more, including the Briery Branch Gap. The coal belongs to the sub-carboniferous formation, and is associated with the white and gray sandstones, some of which are decidedly siliceous, of the respective series, No. X of Rogers' survey (the latter formation resting upon the Catskill red sandstone) and No. IX of Rogers' survey. The Narrow Back and Great North Mountains are of the same formation as the outer-encircling mountains in which are the anthracite coal fields of Pennsylvania.

The veins on the eastern side of the Narrow Back at the Dora mines have been inverted or folded upon their eastern dips, in a manner similar to those in the southern edge of the Pennsylvania anthracite coal fields, but to a much greater degree.

At North River Gap the eastern dip pitches from 8 to 15 degrees east, and the western (or inverted) dip from 30 to 50 degrees east. The coal which has been mined in such openings has been made (which up to this time only extend a few feet from the outcrop, excepting the Scheffer Slope, which is about 70 feet in) is undoubtedly an anthracite, burning freely and leaving but little, if any, residue more than the ash, which is white.

During the late war some 800 tons of coal from the Scheffer Slope was hauled to Staunton, Woodstock and other places, and used successfully for furnaces and cupolas; it has also been used in ordinary coal stoves and given entire satisfaction. The vein in this slope at the face is 6 feet thick, divided into two benches of about equal thickness; the top bench is composed of pure hard coal of excellent quality, while the lower bench has not as yet shown as compact a seam as the upper one.

About 50 feet south of the above opening there is another slope in the same vein which is about 8 feet thick, yielding a much better quality of coal in very large lumps; this slope is about 55 feet deep, but was full of water at the time I was there. This is a very important opening and will doubtless be vigorously worked as soon as it can be cleared of water.

Further up the western slope of the Narrow Back some 200 or 300 feet there is another vein, which, though not yet developed, shows large outcrop. At Briery Branch Gap, about seven miles northeast on the same slope of the mountain, some 100 feet above the foot, there is a shafting upon a vein 4 or 5 feet in thickness, which was also full of water; the coal lying around at the top resembles the Lykens Valley (Pennsylvania) anthracite. All the mines in this field that have been explored have solid rock roofs and floors, which is a valuable feature, adding much to cheapness in mining. The situations of these mines (topographically) are well suited for cheap colliery improvement, and some six extensive collieries may be worked here to advantage. The distance from these mines to Fredericksburg (on tide-water) is, by the new railroad above mentioned, 110 miles.

Messrs. Booth & Garrett of Philadelphia, in their report of February 23, 1877, addressed to Mr. S. D. Kams of that city, president of the Royal Land Company of Virginia, say: "We have often heard of this and other coals of Virginia termed semi-bituminous, semi-anthracite, bituminous anthracite, &c. In order to set the question at rest, we here present three analyses of coal, one of the Lykens Valley (Pennsylvania) from the Phillips & Shaffer mine, of well-known character, and the others of two of your coals, from openings on Briery Branch and Little Coal Run, five miles apart:

	Carb.	Vol.	Water.	Ash.	Total.
Lykens Valley.	87.70	7.30	.85	4.25	100
Briery Branch.	89.47	6.00	.40	4.13	100
Little Coal Run.	89.02	6.42	.50	4.06	100

"The above specimens of coal, like all other coals and ores whose analyses are given in this report, were taken by ourselves from the places whence they are alleged to be found; nor were they specially selected as apparently the best, but as representing averages. There are, we believe, not less than five beds of anthracite in a vertical depth (we estimate roughly) of not less than 200 feet, and it is enough for us to know that for all practical purposes there are three beds of anthracite of from 4 to 6 feet in thickness, and although thus far

only a short distance from the outcrop, still we find that they improve as we enter, just as rapidly as in the best anthracite bed in Pennsylvania."

The above analyses of anthracite specimens from Briery Branch and Little Coal Run, Virginia, compare favorably with careful analyses made by the same gentlemen from seven specimens taken from the same field, and which may be seen in their report of the above date. In connection with the analyses referred to, Messrs. Booth and Garrett further say: "In regard to the use of this coal for burning, we observe: 1st, That it has just that small amount of volatile matter that classifies it as an easy burning anthracite; 2d, That while it has only the percentage of ash of good anthracite, yet the color of the ash proves that it is not liable to form clinkers, cinders, &c. We burned lumps of your coal on a fire of Schuylkill coal, and could not observe the difference in their burning except in the whiteness and looseness of your ash. It is a true anthracite, that burns freely and well. So far from its being a small deposit, we have shown that there are at least three beds, of from 4 to 8 feet in thickness, along a line of at least eight miles. Your anthracite is excellent in quality and abundant in quantity for all domestic purposes and manufacturing operations, and its movement eastward will draw heavily on the transporting power of your road over the 110 miles to tide-water."

Major Jed Hotchkiss, in his late report (Jan. 1, 1878) of the Chambers Survey of Coal Lands lying in Rockingham, Augusta, Pendleton, and adjacent counties, as illustrated by an accompanying map, gives an excellent topographical and geological description of the coal and other resources of that region.

Anthracite coal from Briery Branch and North River Gap will be largely used at the Shenandoah Iron Works as soon as the railroad (above mentioned as projected) shall have been finished from Orange Court House to the above-mentioned mines; 38 miles of this road are already finished and being worked. Yours very truly, T. T. M.

Great Britain's Navy.

The naval power of the United Kingdom is just now invested with such peculiar interest that it becomes worth while to define the extent and character of that fleet which must always constitute the main factor of England's fighting strength, premising that a large share of the recent supplemental credit has been devoted to naval purposes, although the regular appropriation for 1877 exceeded \$56,000,000.

At the last date covered by official reports—December 31, 1876—the British war fleet was composed of 241 vessels in commission. The number of men employed in the service was not less than 60,000, including upward of 33,000 sailors and 14,000 marines. We need not say that the most important division of the force is made up of armored ships. Of these at the date mentioned there were 58, from which aggregate, however, should be deducted three constructed specially for colonial defense, and eight considered too old or too badly built to put to sea, leaving, therefore, a net total of 47 ironclads. Without running through the catalogue of names, we may say that this list includes vessels of all dimensions, from the inflexible, of more than 11,000 tons, whose sides are 39 inches thick, three-fifths of which thickness is represented by iron plates, and which carries 4 cannon, each of 81 tons weight, besides steam engines of 8000 horse-power, to the Favorite, the smallest ironclad under the English flag, whose armor is only 4 inches thick, but which in any other navy would be a formidable craft, having a capacity of more than 3000 tons, engines of 1700 horse-power, and an armament of ten 9-ton guns.

Such was the state of things at the beginning of last year. Let us now see what progress was made during the next twelvemonth. According to the programme put forward by the First Lord of the Admiralty, 6 ironclads were to be finished during 1877, and all the unarmored vessels then on the stocks were to be brought nigh to completion. It promised, moreover, that a new ironclad of the first class should be begun, together with a ram of sufficient power to cope with certain redoubtable engines of war said to be building in Continental harbors, and, in addition, an unarmored corvette, a sloop, and two sailing vessels. In a word, the minister undertook that during the financial term of 1877-78 the national yards should add to the fleet more than 14,000 tons, while private contractors were to build for government account almost half as much again.

Notwithstanding its inability to completely fulfill the above programme, the English government has added a good deal to the veritable solidity of its naval force. Four colossal ironclads were finished and sent to sea in 1877, namely, the Thunderer, the Dreadnaught, the Alexandra, and the Temeraire. One of these, the Thunderer, ought to have been ready for service much earlier, but on the day when it was to make a trial trip one of its boilers exploded, causing an amount of damage which it required 6 months to repair. Besides the two engines of 6000 horse-power which move its screw, there are on board this vessel 26 other steam engines, and a hydraulic machine for the management of the helm, the revolving turrets, and other parts of the apparatus. The Thunderer is covered with plates about 14 inches thick, and carries 4 cannon, each weighing 38 tons. Its mean speed is said to be 13½ knots. Besides armored ships of the same character, the English Admiralty has lately constructed a number of vessels not plated, and furnished with a relatively light armament, but designed to show exceptional fast-going qualities. Some distinguished specialists have severely criticised these experiments, and the controversy on the subject is far from being ended. It is said, for instance, that the new vessels are too powerful for simple cruisers and too weak to engage with ironclads. It is certain that one of the finest types, the Shah, was constrained after a few minutes to renounce the idea of coping with the Peruvian ship Huascar.

The remarkable results obtained by the Russians from torpedoes on the Danube and in the Black Sea could not fail to awaken the attention of the English Admiralty. Numerous experiments have been made in the way of making extremely light steam vessels destined to lodge torpedoes under the flank of armored ships, or to launch that species of explosive provided with means of automatic movement. Essential conditions to the efficiency of such craft are unusual speed and a peculiar facility of evolution. After numerous tests, the English shipwrights have fixed upon a model 8½ feet in length and only 11 feet wide. So far but a single example of the type has been completed, but this, with its powerful engines, has attained a speed of 19½ knots. It is reported, moreover, that fifteen others are now on the stocks, and that the builders have guaranteed a minimum speed of 25 knots. And here we may mention a curious fact bearing on the usefulness of such vessels, and demonstrated by recent experiments, namely, that where their hulls are pierced below the water-line, very little water penetrates, provided the speed be as high as 10 knots, and almost none if it exceed 18. We may add that the Admiralty have lately undertaken the construction of a submarine vessel intended to fix torpedoes under the keel of hostile ships.

Naval artillery seems to have made but little progress in 1877. Hitherto England has contented herself with the Armstrong guns of 80 tons, which are regularly adopted for the armament of her ironclads. Up to the present time Italy alone has gone a little further in this direction, having furnished some of her armored ships with 100-ton cannon. It is said, however, that the famous English engineer is now constructing for government account a cannon of 150 tons. But whatever may be the slight superiority of a few isolated pieces, as in the case just named, there is little doubt that the British iron fleet, taken collectively, both as regards weight of armament and defensive power, is a match for the joint naval forces of the rest of the world.

The Mont Alto (Pa.) Charcoal Furnace.

The Mont Alto Iron Estate, remarkable for its large deposits of neutral brown hematite ore, the uniform excellence of its iron, and the beauty and extent of its park, which is visited by thousands every summer, comprises 20,000 acres of land situated in Franklin and Adams counties, Pennsylvania, and is accessible from Harrisburg by the Cumberland Valley and Mont Alto railroads. The works consist of a charcoal blast furnace and a steam bloom forge. A rolling mill for merchant bar, a chafery and a nail mill were at one time included in the plant, but have been dismantled and abandoned. The furnace stack was built of stone in 1808, and was what was known as a "quarter stack," i. e. it had but one tye, located at right angles to the front. The arches were peculiar to that period—low, squatly and narrow—and everything connected with the furnace was constructed to meet the necessities of a daily product of from 3 to 4 tons. The estate and works were the property of the Hughes family, and remained in their possession until 1864, when they passed to the present owners, the Mont Alto Iron Co., and came under the management of Col. Geo. B. Wiestling. Up to that time, 1864, the furnace retained its old-time peculiarities—its very narrow throat or funnel head; its stone tym and dam; its bright outside snuffing tye. The stack was, and still is, badly cracked. The new management enlarged the throat to 4 feet diameter, and introduced water tym and water dam, and "dark" or inside snuffing tyes. The stack was pierced with two more tye arches, increasing the number of tyes to three, and steam has superseded the old water power.

It is thought this was the first charcoal furnace in Pennsylvania to adopt water tym and water dam, to enlarge her throat and to use fire brick in the construction of the hearth. A run of 27 consecutive months, commencing in 1868, was made at this furnace, at the expiration of which time she was blown out and again started on the same hearth and boshes and run for 10 months more. We believe this is the longest campaign on record for a charcoal furnace without renewal of hearth. No special appliances, such as water blocks or coils, were used to prolong the life of the brick. Slag fier, since called "silicate cotton" and "mineral wool," was made at this furnace in 1868, and with the white pumice cinder served as a great curiosity to the many summer visitors who frequent the Mont Alto Park. The furnace was blown out in December, 1877, after a short run of 172 days, with the following record:

	Tons.	Cwt.
Consumption of ore.	5,103	12
Consumption of limestone.	1,150	2
Consumption of charcoal.	209,466	3
Product, 2,497 tons 15 cwt. pig iron and castings.		

Thus it required for one ton of pig iron:

	Tons.	Cwt.	Qr.	Lbs.
Ore.	2	10	3	1
Limestone.	10	3	11	
Charcoal.	120½	3		
Average daily product.	14.46	tons.		

The iron graded from A 1 to mottled, by far the larger part being gray forge. The ore was exclusively neutral brown hematite from Mont Alto Mine No. 4. The charcoal was made one-fifth in kilns and four-fifths in pits, from a mixture of chestnut, oak and pine wood, the chestnut predominating. The Mont Alto charcoal kilns are believed to have been the first successful kilns in Pennsylvania. The pig iron is sold for car-wheel purposes, and is used in the Mont Alto Forge in manufacturing blooms for fire-box iron and flange plates. The furnace is 37 feet high and 9½ feet diameter of boshes. Taking into consideration this size and her age, the stock used, &c., we doubt if there is a charcoal furnace in Pennsylvania that has exceeded this work.

The Baltimore Car Wheel Co. have recently made a lot of 42-inch wheels for the Grand Trunk Railway and a number of wheels for some Baldwin narrow-gauge locomotives. This company use only Baltimore iron, keep a sample of every day's run for reference, and the record of the history of every wheel made by them. They also do a large amount of work for street railways. The company commenced operations in 1873.

EXPORTS

Of Hardware, Iron, Machinery, Metals, &c., from the Port of New York, for the Week ending March 19, 1878.

Christina.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Ag. imp. pgs. 3 170	70 3,264	
Hdw., pkgs. 450 4,128	51 7,858	
Pumps, pkgs. 8 430	21 800	
Clocks, cs. 41 500	18 1,100	
	6 187	
	116 1,009	

Danish West Indies.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Sew. mach. cs. 3 164	3 315	

Hamburg.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Sew. mach. cs. 710 15,718	20 550	
Hdw., cs. 143 3,590	2 59	
Lea. belt, b'ts. 3 1070		
Ag. imp. pgs. 3 108		
Pumps, pkgs. 27 5,750		
Copper, cs. 10 3,079		
Mach'y, cs. 30 2,310		
Clocks, cs. 388 2,000		

Bremen.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Hdw., cs. 18 717		
Sndp'r, pgs. 4 225		
Mf. iron, pkgs. 13 305		
Lamps, pkgs. 12 100		
Ag. imp. pgs. 262 6,708		
Em'ry wh's, cs. 1 117		
Belting, bale. 1 150		

Antwerp.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Zinc ore, tons, 100 800		

Rotterdam.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Pumps, pkgs. 12 1,045		
Hdw., pkgs. 58 1,881		
Ag. imp. pgs. 266 11,231		
Mach'y, pkgs. 11 308		
Clocks, cs. 5 368		

Liverpool.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Sew. mach. cs. 114 2,137		
Spokes & h's, cs. 55 1,392		
Clocks, cs. 295 5,454		
Brakes, cs. 71 2,893		
Lamps, pkgs. 24 1,234		
Rifles, cs. 2 307		
Belting, case. 1 347		
Mf. iron, cs. 3 307		
Ag. imp. pgs. 187 22,835		
Pt'd ware, cs. 13 1,445		
Mach'y, pkgs. 12 1,455		
Hdw., pkgs. 107 10,372		
Reservoirs, cs. 67 402		
Pistols, cs. 3 800		
Pumps, pkgs. 15 812		
Burners, cs. 4 289		

Bristol.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Hdw., cs. 9 243		

British North American Colonies.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Mf. iron, pkgs. 12 69		
Clocks, cs. 20 241		
Iron, pct. 10 80		
Cr'ge mtl, pgs. 4 26		
Gas flxt, cs. 3 364		
Hdw., pkgs. 8 293		
Ag. imp. pgs. 72 247		

British West Indies.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Nails, kegs. 93 285		
Clocks, cs. 4 85		
Mf. iron, pkgs. 4 38		
C'ge mtl, pgs. 34 1,150		
Hdw., cs. 12 1,124		
Lamps, pkgs. 14 145		
Mach'y, pkgs. 1 119		
Coal, tons, 251 914		

British Possessions in Africa.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Mf. iron, pkgs. 28 230		
Hdw., cs. 10 155		
Clocks, cs. 12 260		

British Guiana.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Carriages, cs. 6 1,400		
Lamps, pkgs. 3 75		
Sew. mach. cs. 4 100		
Hdw., cs. 3 25		
Nails, kegs. 100 200		

British Honduras.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Mf. iron, pkgs. 3 179		
Nails, kegs. 90 253		
Cutlery, cs. 1 100		
Mach'y, case. 1 100		
Hdw., cs. 63 647		
Sew. mach. cs. 3 85		

Haute.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Ag. imp. pgs. 368 10,300		

New Zealand.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Ag. imp. pgs. 208 4,049		
Mf. iron, pkgs. 28 253		
C'ge mtl, pgs. 35 819		
Pumps, pkgs. 6 318		
Clocks, pkgs. 72 1,086		
L'p w're, pkgs. 130 256		
Hdw., cs. 130 256		
Pt'd ware, cs. 6 185		
Sew. mach. cs. 5 520		

Brasil.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Cutlery, cs. 13 278		
Shoe nails, cs. 20 134		
Mach'y, cs. 2 100		
Hdw., cs. 239 4,020		
Pumps, pkgs. 4 60		

London.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Wire g'ds, cs. 8 457		
Ag. imp. pgs. 124 6,040		
Clocks, b'ks. 180 3,179		
Sew. mach. cs. 145 20,818		
Plat'd w're, cs. 10 1,000		
Rifles, case. 1 50		
Mach'y, cs. 3 600		

Imports.

Quant. Value.	Hdw., pkgs.	Quar. Value.
Bussing A.		
Horse nails, pkgs. 15		
Brocker & Evans.		
Wire, b'ls. 112		
Carey S.		
Grindstones, cs. 21		
Millstones, 32		
Dolge H.		
Steeleware, cs. 2		
Degraw, Aymar & Co.		
Chains, cs. 8		
Guenther G. & Son.		
Hardware, pkgs. 4		
Livingstone W. & F.		
Grindstones, cs. 24		
Laugland & Co.		
Wire, b'ls. 43		
Leshar, Whitman & Co.		
Cases, 1		
McCoy & Co.		
Mide, pkgs. 2		
Moore J. P. Boua.		
Wads, cs. 12		
Gun caps, cs. 11		
Empty cartridge cases, cs. 4		
Markt & Co.		
Packages, 8		
Peters Bros.		
Mide, pkgs. 9		
Sanderson Geo.		
Scales, cs. 1		
Spies, Kissam & Co.		
Case, 1		
Sanger, Howard & Co.		
Cases, 2		
Squires H. O.		
Guns, cs. 1		
Schoverling & Daly.		
Guns, cs. 3		
Vogt J. H.		
Wire, cs. 1		
Wiebusch & Hilger Hdw.		
Co.		
Cutlery and hardware, pkgs. 30		
Iron.		
Jansen John A.		
Spiegel, kilos, 150		
Lang W. Bailey & Co.		
Bars, 570		
Bundles, 20		

FOREIGN.

FRANCE.

(Monteur des Interests Matériel.)

PARIS, March 3, 1878.—Metals.—Business in general awakes but slowly from the quieting influence which have held in check a genuine revival during the winter time, and we are afraid there will be no change for the better for at least six weeks to come, when, when the approach of the Exhibition, we expect greater animation here and in Northern France. Copper.—Only fine copper seems to be wanted in Western Europe at present. Chili Bars being easier again here and a little transpiring here, and we note a slight moving way. We quote, deliverable at Havre: Chili Bars, 173.50; Common, do., 170; Ingots and Slabs, 173.50; English Best Selected, 180, and pure Corocoro Ore, 176.50. Marseilles is firmer and quotes as follows: Spanish in slabs, 162.50 francs the 100 kilos; Red Tokat, 170; Small Refined Ingots, 180; Sheathing, 202.50; Bolts, 210, and Yellow Metal Sheathing, 200. Havre is unchanged. Tin has been a little firmer in general, but not where it has been re-acted slightly. We quote Banca here or at Havre, 181; Billiton, 173.50; Straits and Australian, 172, and English at Havre or Rouen, 170 francs the 100 kilos. At Marseilles, on the contrary, there is increased firmness: they quote Banca 185; Straits, 170; Billiton, 170 @ 175, and English Refined, 170. Lead.—This metal remains ill-supported pretty much everywhere in Europe, but there has been no change here. We quote the same 42.75. Marseilles is weaker, and now quotes first fusion soft 44 francs the 100 kilos; second do., 43; Sheet and Pipe, 40, and Shot 50. Spelter has been inactive here, but firm at Marseilles. Marseilles is steady and quotes as follows: Vieille Montagne Sheet, 67 francs the 100 kilos; Southern, 65, all less 3%; Old Remelted in Slabs, 45. Iron.—We can expect no favorable change till the general situation in Europe inspires more confidence. At Cherbourg several adjudications have come off yesterday, mostly for telegraph material, such as cable wire, &c. In the Ardennes the hardware manufacturers are busy, and in the north the chain are also in some demand; there is not a great deal doing yet in that quarter, but the prospect is good, and some manufacturers are revising their lists, and raising prices in anticipation of a lively spring trade. In the Meurthe-et-Moselle, Moulage Pig Iron is wanted, and the same is now quoted 78 @ 79 francs. Rolled Iron enjoys but a slight demand in the north, and hardware manufacturers are more exclusively engaged at present in working for the Paris market, and supplying the current requirements which we have. They quote Merchant Iron, 160 @ 165 francs. First-class heavy special iron commands at the works, 165. At the Center there is much complaint; the only district where some activity is being displayed is the Terrenore; everywhere else in that region work is being suspended, and the establishments are closing. Sheet iron seems to be the only article still meeting with a sale. The Coal situation in France is anything but a satisfactory one, and in the Pas-de-Calais and North, despite the coal production, mixed Coal has again declined 50 @ 1 franc per ton. In the Loire basin there is some show of activity, but producers are not sanguine, the prospect for an extensive sale of Coal for industrial purposes being but a slim one.

Belgium.

(Revue Universelle.)

BRUSSELS, March 3, 1878.—Metals.—Pig Iron has remained quiet, but Merchant Iron is looking up and active. On our railroads Iron sleepers are gaining in popularity; thus the Grand Central will introduce on its line the Serres and Battig method. In Austria this success has produced good results on account of its simplicity. There has come off during the week an adjudication for the supplying of the State railroads with new passenger cars, and the Belgian Railway Material Company has on the occasion secured the furnishing of 16 first-class cars upon the American plan at 12,850 francs per car; of these 16 there are 8 saloon cars. Mr. A. Cabany, of Malines, has obtained the furnishing of 10 second-class ditto at 8,000 francs. The numerous other car makers will furnish the remaining 48 third-class cars at between 6,500 and 6,575 francs each, all on the American plan. Some 17,500 tons of rails have also been ordered in Belgium, mostly for use at 120 @ 125 francs 90 tons. The accounts from Charleroi are unfavorable. The only species of articles in the Iron line in demand there are Bar Iron, Sheet and small Rails for horse railroads. The Steel works are picking up somewhat.

Germany.

(Borstenhaller.)

HAMBURG, March 3, 1878.—Metals.—Business is picking up slowly as the spring season approaches. Copper.—No transactions of magnitude are reported. What little consumptive demand there is is easily filled at ruling moderate figures. There is no change in prices either here or at Stettin. Berlin is quiet, and quality good. English and Australian sells between 72 @ 77 marks the 50 kilos. Tin.—The German markets are weak. At Berlin, Banca is quoted 74.75 @ 75 marks the 50 kilos, and English Refined, 73 @ 75.50. At Stettin, here and nominally unchanged. Stettin reports no change. Lead.—This metal is irregular, and it is difficult to determine where prices will finally settle to. Berlin quotes Tarnowitz, Harts and Saxonian 18.50 @ 19.50 marks the 50 kilos. Hamburg and Stettin unchanged. According to a telegram from St. Petersburg, Lead on the spot there commands 34.50 @ 35 roubles the 164 kilos. Spelter.—Nothing of special interest has happened in this metal. Berlin remaining 19.20 @ 20 marks the 50 kilos, and Stettin together, with this market unchanged.

Holland.

(Eck & Vloerboom.)

ROTTERDAM, March 3, 1878.—Tin.—Banca has been sold at 40.50 guilders the 50 kilos, both on the spot and deliverable from the coming March sale, and Billiton at 38.25, while on more distant delivery it is selling at 38.50 @ 38.75. On the spot Banca at 40.50, and Billiton at 38.50. Stock on warrants in the hands of the Netherlands Trading Society, 1st inst., 51,274 Slabs Banca, and 23,230 Billiton, against 61,803, and 24,141 in 1877. Delivery since January 1, 19,323 Slabs Banca and 18,641 Billiton, against 20,331 and 20,100. Afloat from Banca by sailing vessels 4,200 piculs, against 17,775 in 1877. There have been delivered of Billiton Tin from private hands in February 25,515 slabs; since January 1, 12,421 slabs, and the stock here and at Amsterdam is 33,955 slabs. Lead is lower, but at the decline there is more doing. We quote Stalberg 11 guilders the 50 kilos, Eschepold 10.50, and we note immediate sales. San Andres Spanish may still be procured at 10.50 @ 10.62 1/2, to arrive.

Spain.

(La Provincia.)

HUELVA, Feb. 27, 1878.—Copper.—The Rio Tinto Copper Mining Company has agreed with the Rio Tinto Company, and Messrs. Mason & Barry, owners of the Domingo Company, its principal competitors in pyrites, to fix upon their product a common price. Out of 800,000 tons annually imported into England these three mining concerns furnish about 600,000, the consequence being monopolize the article. The agreement seems to be that the Rio Tinto Company is to sell 40 per cent. of what England will take during the year, and besides 50,000 tons of the content, the share of the Rio Tinto Company has risen materially.

East Indies.

(Gillman, Wood & Co.)

SINGAPORE, January 31, 1878.—Tin.—The market has been very steady; all the Malacca that has arrived having been sold at 18.62 1/2 per picul. Supplies have not been so large as usual, and are supported before the Chinese new year, and this has supported prices. The Straits' shipments this month to the United States are 450 tons, including 100 tons by rail to Boston.

A certificate of incorporation has been issued to the Laughlin Nail Company, an association formed for the purpose of manufacturing pig iron and nails in West Virginia and Ohio, dealing in iron and other merchandise and coal mining. The principal office is to be at Wheeling, and the corporation

expires March 11, 1898; \$40,000 has been subscribed and \$6000 paid in, and the privilege of increasing stock to the amount of \$250,000 is reserved. Shares are \$100 each, of which Alex. M. Laughlin holds 100; Samuel Laughlin, 100; Alonzo Loring, 100; Mason W. Burt, 50; David Gutman, 50. This is formed to operate the Ohio City Mill. The negotiation for the purchase has been on foot for some time, and it is said that an offer of \$60,000 was made on Saturday but was withdrawn, and after some further chaffering the property was bought for a sum between \$50,000 and \$60,000, the exact amount not being made public. The amount of cash required will be little, if any, in excess of \$10,000, it being understood that the indebtedness, secured by deed of trust upon the mill property, will be allowed to stand as long as desired on payment of the interest accruing on the bonds. It is the intention of the buyers to put the mill in thorough repair and start it as soon as possible.—Wheeling Standard, March 11.

Special Notices.

JENNING'S COMBINATION DISCOUNT TABLES.

(Published by the author.)

This Book contains 1,200 tables for single and combination discounts, such as 37 1/2 %, 45 %, 50 %, 55 %, 60 %, 65 %, 70 %, 75 %, 80 %, 85 %, 90 %, 95 %, &c., &c., which are so arranged as to be found without loss of time, and by their use either the Discount or Net on any amount of dollars and cents, from a penny to one million dollars, can be ascertained in a few seconds entirely by Addition.

OPINIONS.

MONTEAL, March 4th, 1878.

S. H. JENNING, Esq., Deep River, Conn.

DEAR SIR: The Book of "Combination Discount Tables" was duly received by us as per our order. The writer has since its receipt given the Tables a variety of tests, as to their practicability, accuracy and usefulness for the purposes indicated in the preface of the work. As the result of these tests, we have much pleasure in giving it our hearty commendation, and think it a work that should be possessed by everyone having occasion in their business to check or arrive at the net results of combination discounts from invoices.

As a conservative of the mental forces employed in tedious calculations, it is worth many times its cost. Yours respectfully,

WILLIAM L. WATSON & CO., Hardware and Metal Merchants, MONTREAL, CANADA. Per Wm. Small, Manager.

It will be mailed, postpaid, to any address, on receipt of the price, \$3. Currency may be sent by mail at my risk. Address

S. H. JENNING, Deep River, Conn.

Torrence & Co., General Shipping & Commission Merchants,

127 Walnut Street, Philadelphia.

We are acting for a number of prominent manufacturers in finding a foreign market for their goods, and would be pleased to correspond with any parties who may desire to develop this trade.

To Nail Makers.

For Sale or Lease on reasonable terms, the North Western Rolling Mills and Nail Works.

Situated at Dunleith, Ill., on Mississippi River, and close to track of Ill. Cent. R. R. New and improved machinery in best condition. Scrap iron and coal to be had cheap. A splendid chance to practical man with moderate capital. Reason for selling, proprietor does not understand business. Will exchange for good lands, iron lands preferred. Address

G. T. WALKER, Proprietor, Lancaster, Wisconsin.

To Manufacturers and Jobbers of Hardware, Cutlery, &c.

Manufacturers and Jobbers, having surplus stocks or goods that from any cause are unsaleable upon which they wish to realize, or assignees who have stocks to dispose of, will find a cash purchaser by communicating with

W. M. CALDWELL, Dealer in

Job and Auction Lots of Hardware, Cutlery, &c., 102 Chambers St., New York.

WANTED.—A first-class business man familiar with manufacturing, capable of handling large bodies of men, desirous a responsible position. References satisfactory. Address, IRON AND STEEL, Care of P. O. Box 813, Bridgeport, Conn.

Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy. A practical man with means is wanted to join a practical man who is already well established. Address

CAR WHEEL FOUNDRY, P. O. Box 134, Selma, Alabama.

WANTED.—By a young man of general business experience, a situation in any capacity that he may make himself useful. Ten years in the hardware trade. No objection to leaving the city. Office of The Iron Age, 83 Reade St., New York.

International Exhibition

Of Agricultural Machines and Implements, Hamburg, Germany, 1878.

Under co-operation of the Section for Agriculture and Horticulture at Hamburg, and the Union of German Manufacturers and Dealers in Agricultural Machines, an International Exhibition of Agricultural Machines and Implements will be held at Hamburg, Germany, beginning on the 13th of June, 1878, and ending on the 17th of the same month. Circulars and printings to be filled out for sending goods to the said International Exhibition are mailed free of charge, upon application, from the office of the undersigned committee, at

No. 25 A B C Street, Hamburg.

Advertisements for the catalogue

Zinc.—Sheet is very quiet. Mosselman is quoted 8¢, gold, and Domestic 6¾¢, currency.

AMERICAN REFINED BAR IRONS.			
1 to 6 wide by $\frac{3}{4}$ to 4 thick.....	10	10	2 10
to 4 $\frac{1}{2}$ wide by $\frac{3}{4}$ to 4 thick.....	10	10	2 10
Round and Square, ordinary sizes	10	10	2 10
to 3 to 4 inclusive.....	10	10	2 10
Hoop Iron, $\frac{3}{4}$ wide and upward.....	10	10	2 10
Band Iron, from $\frac{3}{4}$ to 4 in. wide.....	10	10	2 10
Horse-shoe Iron $\frac{3}{4}$ to 1 wide by $\frac{3}{4}$	10	10	2 10
to 1 thick.....	10	10	2 10
Norway Nail.....	10	10	2 10
Black Diamond Cast Steel Plate,	10	10	2 10
Squares and Octagon, ordinary	10	10	2 10
sizes.....	10	10	2 10
Machinery Steel.....	10	10	2 10
Spring Steel.....	10	10	2 10
Homogeneous Cast Steel.....	10	10	2 10
Perkins' Horse shoes, $\frac{1}{2}$ keg of 100 lbs.....	10	10	2 10
" Mule shoes.....	10	10	2 10
R. R. Spikes.....	10	10	2 10
Common Horse Nails.....	10	10	2 10
Putnam Horse Nails.....	10	10	2 10
Globe Horse Nails.....	10	10	2 10
Least list discount to the trade.	10	10	2 10

Over a month ago I received offers to provide work for a number of the colliers out of employment in the South Wales districts from gentlemen engaged in coal-mining operations both in Lancashire and North Wales. These offers of employment having been made known to the Rector of Merthyr, first by myself, and afterward by the honorary secretary of the Liverpool South Wales

Relief Committee, and no response in the form of a supply of men, or offer to supply men, having been made up to Monday last, and as it was made evident that the Liverpool public were somewhat indisposed to contribute relief without, at least, an explanation, I offered to go and investigate the matter if the Liverpool committee would bear the expenses of the journey. This the committee consented to do, and on Tuesday last I started for Merthyr, with a full determination to find out if it was true, as report gave it out, that the Welsh working miner would not take advantage of offered work if he could manage to exist without it. I am forced to acknowledge I started on my mission with some misgiving; it seemed so strange that such practical, permanent relief as good employment was not taken immediately advantage of.

On my arrival at Merthyr I at once waited upon the rector, explained to him the object of my visit, and asked particularly for information on the following points: 1st. Were there many collieries out of work in the district of Merthyr? 2d. Were they in distress as painful as had been described by the correspondent of the *Daily News* and others? 3d. Were the colliers disposed to work, or was it true that they were only inclined to work at labor that fell in with their particular liking, and when it suited them? 4th. Did they object to move out of the district if work was offered them in other parts? In substance the rector's replies were as follows: That there were hundreds out of work in Merthyr alone; that the distress among them was far in excess of what had been described; that the men were not only willing but anxious to obtain employment, and would work at anything that offered; and that, although they had a strong liking for "home," he was quite sure they would gladly accept employment anywhere; and, in reply to my request for explanation how it happened, under all these circumstances, that a supply of men had not been sent to Liverpool, he stated that personally he had been so overwhelmed with work that, although he had had the assistance of two clerks attending to the corresponding department, it was as much as could be done to get through it, and in addition he had, in company with his wife, to attend to the distress of some 2500 children, besides other work the distress in the district entailed upon him in addition to his other duties; that it was impossible for him to undertake the responsibility of picking out men to send down; that he had no money at command to pay their expenses; and that (let this be especially noted) he could not find any one willing—in fact there was a decided objection on the part of every one with whom he was associated—to do anything at all in the matter of removing men from the district. He could give no reason for it, but was evidently pained at having to acknowledge that although he was satisfied that the best way of meeting—in fact, the only effective way of coping with—the distress, was to get a lot of the men out of the district altogether; still, for some reason he could not define, he could not obtain co-operation to that end.

Having pointed out to the rector the double injustice to the men involved in this absence of effort on the part of those whose duty it was to assist them—unjust because it was the withholding of the power from the men to go where work awaited them, and was also depriving them of that benevolent sympathy so necessary to them in their distress, and in addition it was calling down upon them a blame they in no way deserve—I asked the rector could he, in reason, expect a continuation of help, either from Liverpool or any where else, if the demand for men was not complied with, whether it was for a single one or for a thousand. The rector, fully agreeing in this view, expressed his determination to help me, and on his own responsibility he called a meeting of the unemployed colliers of Merthyr, at the Temperance Hall, for the following night (Wednesday), thus giving me the opportunity of personally making the offer of work to the men; and on Wednesday night the men learned, for the first time, that work had been waiting for them nearly a month.

I proposed the following plan to the rector for meeting the question of expense. He was to advance out of the funds he had in hand the amount of railway fare required to get the men to districts where they could be employed, I undertaking to see that the men paid back by weekly installments the amount thus advanced, the weekly installments to be a deduction from the wages under an agreement between the men and the employers. As this was a point that had to be brought before the Committee of Relief at Merthyr, the way in which it was decided is best given in the letter from the rector received by me on my arrival at home. The letter is as follows:

"THE RECTORY, MERTHYR, Feb. 15, 1878.
"MY DEAR SIR: I am glad to tell you that I had at once more than double the men you require to take work, and I have no doubt I can get any number—any 500—to go wherever you shall want them. I obtained a loan of £50 from the Starving Children's Fund to prepay, if necessary, the railway fares, after having explained to a large committee of 22 members what you told me, that you would be responsible for its being paid back to the fund. But it was not without opposition; that is, 20 voted for it, 2 against it. Please to let me know as early as you can where the men are to be sent to. They are the pick of our colliers, all fine young men, and nearly all single.

"I hope this is a complete answer to the *Times*, &c., and that it will satisfy our Liverpool friends of the bona fide character of the honest desire of Welsh colliers to work where they can. Some of them were ready to start at once, if they could only get the fare. Some of them actually came straight from underground, with "lamp" in hand, and unwashed, for fear their chance should be a late one. With many thanks to you. You have left a grateful remembrance behind you here.

"I hope this will meet you on your return from London to-morrow. Yours truly,
"W. SIMPSON, Esq. JOHN GRIFFITH.
"P. S.—One thing very worthy of notice—and pray do note it—not a single man whose name I have yet taken asked me this vital question, 'What wages are we to have?'

Nothing speaks stronger for the men's desire to work. All they want is work anywhere to feed their starving wives—for the children we take care of—and they will take it. Not a question has ever yet been asked about wages and its rate in the neighborhood."

The contents of this letter I think will give general satisfaction, for it proves incontestably that the Welsh miner is willing to work anywhere if he only has the chance fairly given him. Many of them waited for me coming out of the hotel on Thursday morning, ready to come with me anywhere to get work. The blame of lost opportunities must not, I am satisfied, rest on the men, but must be charged against a selfish greed that would rather keep men in a starving condition than lose the present chance of trying to make a little profit out of a glutted labor market.

On Wednesday morning I started up the Taft Vale to visit Mountain Ash, Aberdare and Pontypridd. Stopping at Mountain Ash, I walked up to Duffryn Hall, for the purpose of seeing Lord Aberdare, wishing to explain and consult with him on the object of my visit. His lordship being in London, and Lady Aberdare being indisposed, his lordship's eldest son, the Hon. H. C. Bruce, entered warmly into my views, and not only promised his fullest support, but at once offered to drive me to Aberdare and Pontypridd to give me introductions to gentlemen he thought most likely to advance the wishes of those I represented. Unfortunately, the vicar of Pontypridd was from home, and his curate was laid up with bronchitis, and I had only the chance of explaining myself to Mrs. Crawshaw, a lady indefatigable in her endeavors to assist the poor by whom she is surrounded; the stipendiary magistrate, Mr. Williams, and a clergyman of the Established Church, also, I believe, named Williams. This latter gentleman I found busy at work in the soup kitchen belonging to one of the districts into which Pontypridd is divided. From him I had the gratification of seeing how perfect is the system adopted for giving relief, and how by the system it is made almost impossible for imposition to be practiced.

Pontypridd is divided into districts. A clergyman of the Established Church and a Dissenting minister have practically the joint charge of a district for relieving purposes. A relief book is kept, and is so arranged that you can tell almost at a glance how much each person receives weekly in wages for work, no matter for whom the work has been performed; how much parish relief is received; and how much relief is given by the district relief society.

Accompanied by this clergyman, the Hon. Mr. Bruce and myself made visits into some of the houses of the distressed ones, and for the first time in my life I stood face to face with poverty and distress, misery and wretchedness, utterly beyond the power of man to describe. So intensely painful is it to look upon that its reality becomes almost a question of doubt. To tell you that there was no furniture, no food, hardly any clothes, and only the dying embers of fire, is the simplest language that could be used to convey the intensity of that indescribable misery that must be seen to be in any way understood. You must see the human beings that inhabit these weather sheds, and have fastened on your souls expressions from eyes that speak that hope is dead; you must see the human form divine hanging on, as it were, to its own particles, out of sheer desperation; you must hear the human voice utter the words, "The parish allows me 2/ a week; out of that I have to pay 1/6 for rent, and 3d. for the burial club, which leaves me 3d. to live upon; and with the exception of a little soup from the kitchen, and sometimes a little tea and sugar Mrs. Crawshaw gives me, I have not had anything else to live upon for months." All this you must see if you would realize the sorrows that surround the aching woe of that suffering that must exist with her who says, "Look at my arm, sir; let it tell if I am hungry!" or you must hear a mother say, "If I had only bread to keep the children from crying, sir, I could bear it; or the wife saying, 'It's bad enough to have your husband ill, sir, but to have him ill and starving at the same time it is very hard; it's awful hard!'

Yes, and I thought how hardhearted must be those officials who, with kind consideration for those who do not suffer, dole out a miserable parish pittance, just enough to pay the rent, and then try to prove the accounts of the distress are greatly exaggerated by pointing to the fact that the outdoor relief expenses this year only exceed last year by £30. Shame! I say on all who thus pride themselves on their parochial economy while these poor distressed brothers and sisters are perishing for want of bread. Let the poor-law guardians of these distressed districts of South Wales see to this, for on them must lie the responsibility of a state and condition of things disgraceful at once to civilization and a practical denial of every principle breathed in the word Christianity.

Sick at heart, and weary of what I had witnessed, I returned with the Hon. Mr. Bruce to Mountain Ash, and on Thursday left South Wales for London, whither I was journeying to obtain, if possible, a special rate of fares for men I hope in a few days to see at work in our own neighborhood. I unhesitatingly declare that the poor law has failed to meet the requirements of the distress, even though supplemented as it has been by public subscriptions, and that a special government officer, unfettered by local ties or prejudices, ought to be sent down with full power to relieve the distress.

I cannot close this report without drawing attention to the joy I felt at seeing little boys and girls, aye, and little children, leave Duffryn Hall with a pair of new clogs on their tiny feet, when only an hour before I had seen them trudging through the sludge with their feet quite bare. I must also give expression to the gratification I experienced at seeing how devotedly the family of Lord Aberdare follow out the grand work of relieving the distress. I must not forget to mention a drill sergeant who gives his services from morning till night at the soup kitchen, Mountain Ash, with the faultlessness of a professed French cook; in fact, praise is due to everyone in the district I visited who ungrudgingly give their time to assuage the bitter distress.

In conclusion, let me make one last appeal

to those who have hitherto filled the "bowl." Two thousand pairs of clogs are wanted, and must be sent; a greater blessing cannot be offered the perishing little ones. These, with stockings, will cost about £200. Who will help to buy clogs?

The Stafford Scroll Saw.

In this machine we have the novel feature of the saw fastened at the upper end only. All who have used scroll saws have felt the annoyance of being compelled to pass the end of the saw through the wood, fasten it, and then unfasten and pass it out again as each opening is finished, however small the opening may be; and while sawing is a pleasure, continually adjusting the saw is a great inconvenience. In using this machine it is simply necessary to pass the end of the saw down through the wood from the upper end and commence operations, and when one opening is finished it can be raised clear of the wood, and is at once ready to be passed down through the next opening to be sawed. The wood need not be raised from the table, as is the case where the saw is passed up from below. The opening in the table is just large enough to allow the saw to pass through, having a solid bearing for the wood. This improvement very greatly lessens the danger of breaking fine patterns. The saw does not break in being driven down through the wood with no wider fastening, because it runs in a slot above and below the table just deep enough to take the back of the saw without injury to the teeth, and only a short distance is exposed to the pressure of the wood. Thus when sawing wood one-quarter inch thick, three-eighths of an inch only of the saw is exposed; the distance



above the wood necessary for the stroke is still confined in the slot and cannot bend sideways, and the pressure of the wood holds it back in position. The guides are so arranged that the opening can be increased or decreased to allow for different thicknesses of wood. The usual thickness of wood employed for scroll work can be cut nicely with the saws usually sold for that purpose, but much heavier wood can be cut by using larger saws, which are held as easily as the smaller ones. As the saw is confined in the slot, the swaying or "wobbling" motion so frequently met with is avoided, which is a great aid to accuracy of work. Having no spring to overcome the machine, it starts and runs easily and with very little noise. As there is no spring, one serious loss of power between the wheel and saw is avoided and a very perfect control of the speed is obtained. Where a still greater stiffness in the saw is desired, it is obtained by reversing the saw and making it cut upon the up stroke only. The main belt is carried up from the driving wheel around a grooved pulley to another pulley on a countershaft; directly over the saw a crank and connecting rod upon the end of the shaft are used to drive the saw.

The saw frame and clamp can be raised or lowered as may be desired, leaving room enough below the foot for the wood. The operation of putting in saws and adjusting them is very simple, and the saw is quickly and easily raised above the wood so as to enter a new opening when "inside work" or inside sawing is being done. There is an arrangement for tilting the table and securing it at any angle. A cup beneath the saw catches the dust and prevents it from falling upon the clothes. An air pump is attached to the clamp which keeps the surface of the wood free from sawdust. The drill remains at rest except when in use. It is started by shifting the main belt from the pulley at the back of the machine to a smaller one by its side. The machine is complete in itself and can be set on any stand. The No. 2 machine, as shown in cut, will swing 15 inches between saw and frame, has a 12-inch polished iron tilting table drilling attachment, with self-centering steel drill chuck, blower, dust cup, double foot treadle, one drill, one dozen saws, pair cutting nippers and wrench. It is well made, and mounted on iron stand with black walnut top.

It is intended by the patentee to make heavier machines, to be run by power, which will be capable of using larger saws and doing heavier work. The patentee and manufacturer is Mr. N. Stafford, of 66 Fulton street, New York.

Russo-American Grain Elevating Contract.—A cablegram announces that several well-known New Yorkers have received certain concessions from the Emperor of Russia, granting them the privilege of elevating grain throughout the empire. The parties referred to are E. G. Burgess, president of the Floating Elevator Co.; L. B. Shaw, president of the Grain Warehousing Co., and T. B. Lane, of the International Grain Elevating Association. As yet none of the gentlemen consent to speak of the nature of

the contract further than to say that they expect to receive official information by the end of the month. The process of handling grain in Russia is of the most primitive kind, and the inference is that the Americans spoken of have the privilege of introducing their system as a substitute.

Engineers' Club of Philadelphia—Interesting Subjects Considered.—Recent meetings of the Engineers' Club of Philadelphia have been especially interesting. At one of them Mr. Charles A. Ashburner read a paper, entitled, "Where is Petroleum Found?" He said the oil regions of Pennsylvania were divided into three districts, viz: The Southwestern, south of the Ohio River and west of the Monongahela River; the Western, along the Allegheny River and tributaries between Pittsburgh on the south and the Philadelphia and Erie Railroad on the north; and the Northern district, north of the Philadelphia and Erie Railroad, extending into New York State. In Pennsylvania 3000 feet of the rocks of the carboniferous and Devonian ages have been found to contain mineral oil. The highest producing "sand" occurs in Washington county, 165 feet below the Pittsburgh coal seam; the lowest in McKean county, 3200 feet below the geological position of the same coal bed. The Bradford oil, in McKean county, comes from a horizon 400 feet above the lowest. On a basis of a daily production of 40,000 barrels, each of the nine different "sands" in which oil is found was given its respective production. In speaking of the percentage of risk which the producer experienced in obtaining dry holes, the Southwestern district is stated to be the most treacherous, and the Northern the safest, for in the latter the percentage of dry holes is only three wells in every hundred. Specimens of the "sands" and crude oils were exhibited, and formed an interesting feature of the paper. At the last meeting of the club, a paper on the "South Street Bridge," by Prof. L. M. Haupt, was read. His estimates of the pressure on the piles forming the foundations for the piers of the western approach, had been calculated from data obtained from drawings in the office of the City Engineer. Mr. Haupt thought that as the piles were driven through or into soft mud, which is inundated at every tide, the pressure placed upon them was in excess of their bearing power in such soil, and the cause of the fall of the structure.

Contracts for Rolling Stock.—The Executive Committee of the New York Elevated Railroad Company meet to-day, and are expected to award contracts for building 30 locomotives and 60 cars. The Gilbert Railway Company are having 60 cars built for them at the Pullman Palace Car Company's works in Detroit, and most of them are already far advanced. They cost \$4000 each.

The Havre (Pa.) Iron Co., who purchased in the year 1866 four tracts of mineral land situated in Harford county, about 16 miles from Havre de Grace, with a special view to the mining of iron ore, have made discoveries within the past three or four years of an almost inexhaustible supply of serpentine stone of superior quality upon their property, and the quarrying and preparation of this stone bids fair to develop into an industry of considerable magnitude. The deposit comprises a very large bed of green serpentine, presenting a thickness of about 500 feet, and under this a bed of black mottled serpentine about 800 feet in thickness. The outcrop of the green serpentine has been traced for a distance of over 1500 feet. It is susceptible of a fine and brilliant polish, superior to verde antique and only equaled

by Belgian black marble, and is well adapted for numerous purposes, forming table tops, mantels, columns, &c., of exceptional beauty. The company expect to have a mill in operation by the 1st of May, adapted for running four gangs of saws. It is likely that the serpentine will be used to a considerable extent for ornamental columns.

There is no doubt that the German iron trade will be very favorably influenced by the great railway works projected by France. Bessemer rails in France have risen to 250 francs per ton; and although the price in Germany is about 30/ to 35/ per ton lower, we cannot export iron to France on account of the high import duty. But the great demand in France will prevent the French manufacturers from competing with Germany in neutral markets in foreign parts, the German puddling works having hitherto been subjected to sharp competition by the French ironmasters, particularly by the great iron works at Creuzot; in Italy, Spain, Switzerland, Belgium, Russia, Holland, Turkey, Egypt, and other foreign countries. —*Frankfort Stock Exchange and Commercial Gazette.*

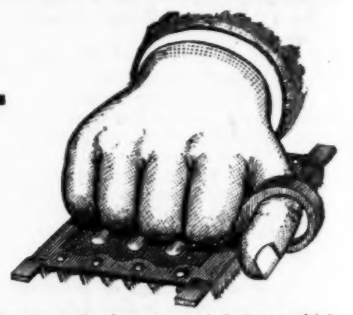
The Wells & French Mfg. Co., of Chicago, have recently been incorporated with a capital of \$100,000. The specialty of the company will be the manufacture of cars, turn-tables and bridges.

London Metal Market.

(From The Mining Journal.)

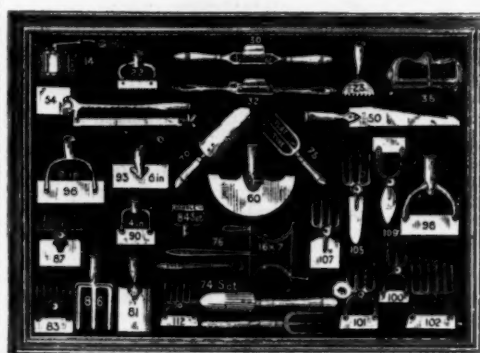
	£.	s.	d.	£.	s.	d.
Iron, pig, f.o.b. Clyde...	2	11	0	—	—	—
" Scotch, all No. 1...	2	12	6	3	10	0
Barrs, Welsh, f.o.b. Wales...	5	5	0	5	10	0
" in London...	5	15	0	6	0	0
" Stafford, in London...	7	0	0	8	0	0
" in Tyne or Tees...	5	10	0	5	15	0
Swedish, London...	9	15	0	10	0	0
Rails, Welsh, at works...	4	5	0	4	2	6
Sheets, Stafford, in London...	8	15	0	9	0	0
Hoops, Stafford...	7	15	0	8	5	0
Nail Rods, Stafford, in London...	6	10	0	7	0	0
Steel						
English, spring...	14	0	0	19	0	6
" cast...	30	0	0	40	0	6
Swedish, keg...	16	0	0	—	—	—
" tag, hamp...	17	0	0	—	—	—
Lead						
English, pig, common...	18	5	0	18	7	6
" L. B. ...	18	7	0	—	—	—
" W. B. ...	18	15	0	—	—	—
" Sheet and Bar...	19	7	6	—	—	—
" Pipes...	20	0	0	—	—	—
" Red...	22	0	0	22	10	0
" White...	27	5	0	33	0	0
" Patent Shot...	23	10	0	—	—	—
Spanish...	17	17	6	18	0	0
Nickel...	18	0	0	20	0	0
Metal, per cwt...	18	0	0	20	0	0
Ore, 10 per cent, per ton...	14	0	0	20	0	0
Flasks of 75 lbs., ware...	7	2	6	—	—	—
Flasks of 75 lbs., ware...	7	2	6	—	—	—
Silician or Rhenish...	18	15	0	18	17	6
English, Swansea...	21	0	0	—	—	—
Sheet Zinc...	22	0	0	23	10	0
Flu.						
English, ingot, f.o.b. ...	67	0	0	—	—	—
" bars...	68	0	0	—	—	—
" Refined...	70	0	0	—	—	—
Australian...	65	0	0	—	—	—
Banca...	66	0	0	—	—	—
Straits...	63	15	0	—	—	—
Copper						
Tough Cake and Ingot...	66	0	0	66	0	0
Best Selected...	73	0	0	72	10	0
Sheets and Sheetings...	73	0	0	75	0	0
Flat Bottoms...	70	0	0	—	—	—
Wallaroo...	70	0	0	nom.	—	—
Burma, or P. C. C. ...	73	0	0	nom.	—	—
Other brands...	70	0	0	—	—	—
Chili bars, g. o. b. ...	62	0	0	—	—	—
Bearing Metal...	112	0	0	—	—	—
Other Alloys...	120	0	0	140	0	0
Brass						
Wire...	0	8	8 1/2	—	—	—
Tubes...	0	0	10 1/2	—	—	—
Sheet...	0	0	10 1/2	—	—	—
Vel. Met. Sheet & Sheet...	0	8	8 1/2	0	0	0 1/2
Nails composition...	0	8	8 1/2	0	0	9
Flu plates—1/2 box...	1	0	0	1	1	0
Charcoal...	1	0	0	1	1	0
" 2d qual...	0	19	6	1	1	0
" 1st qual...	0	18	0	1	1	0
" 2d qual...	0	17	6	1	1	0
Black...	0	10	0	16	10	0
Canada, Staff, or Glas...	11	10	0	12	0	0
at Liverpool...	11	10	0	12	0	0
Black Taggers, 450 of 1x10 30	0	0	0	—	—	—
at the works, 15 to 18 dd. per box less for ordinary	100	per ton less for Canada; 1/2 5s. per box more than	10	10	10	10
IC quoted above, and add 6s. for each X. Terne plates	2s. per box below in plates of similar brands.					

HOTCHKISS' Novelty Combs.



We ask the attention of the public to our Patent Novelty Curry Combs, represented above, which are universally acknowledged to be far superior to anything in the market, being neat and durable and the most convenient to handle of any comb yet produced. They are put up in paper boxes of one dozen each, and packed 24 dozen in a case. GIVE THEM A TRIAL. For Sale by the jobbing Hardware, Saddlery and Woodenware trade.

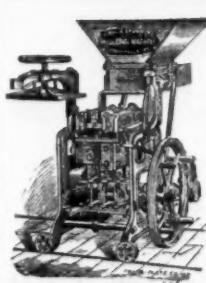
HOTCHKISS' SONS, Bridgeport, Conn.



Sedgwick Mfg. Co.

- Nos.
14, Door Spring.
22 and 23, Carpet Stretchers.
30 and 31, Spoke Shaves.
35, Saw Sets.
50 and 54, Pruning Saws.
60, Edging Knives.
70, Garden Trowels.
75, Weeding Forks.
76, Garden Reels.
74, 80 and 84, Garden Seta.
90 and 95, Shuffle Hoes.
93, Sedgwick Shuffle Hoes.
98, Floor Scraper.
100, 101, 102, 105, 107, 109, 112 Hoe and Rakes.

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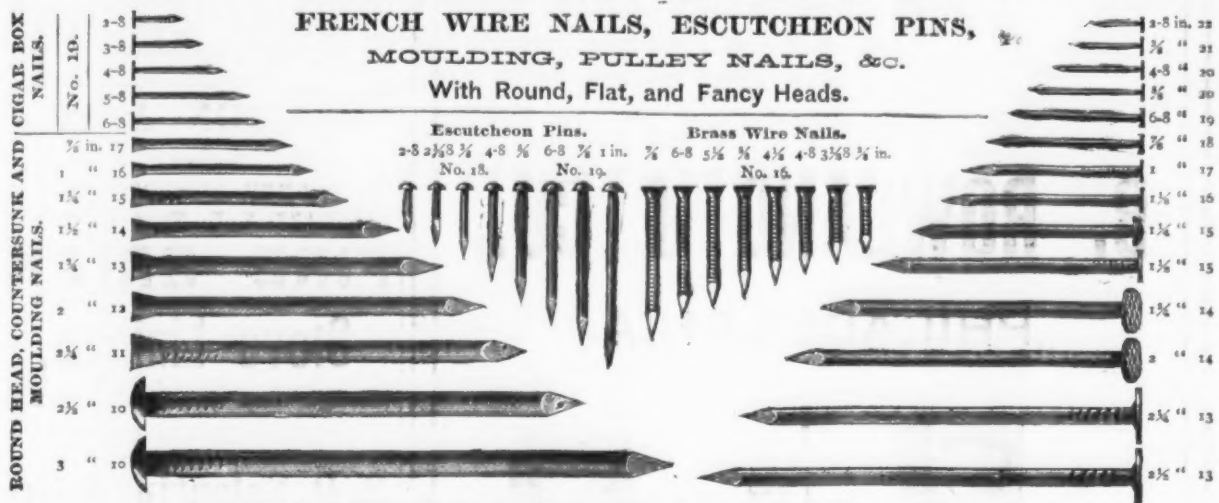
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MANUFACTURED BY
DUNBAR, HOBART & WHIDDEN,
ESTABLISHED 1810.

Office and Salesroom, 116 Chambers Street, New York. . . . Factory, South Abington, Mass.



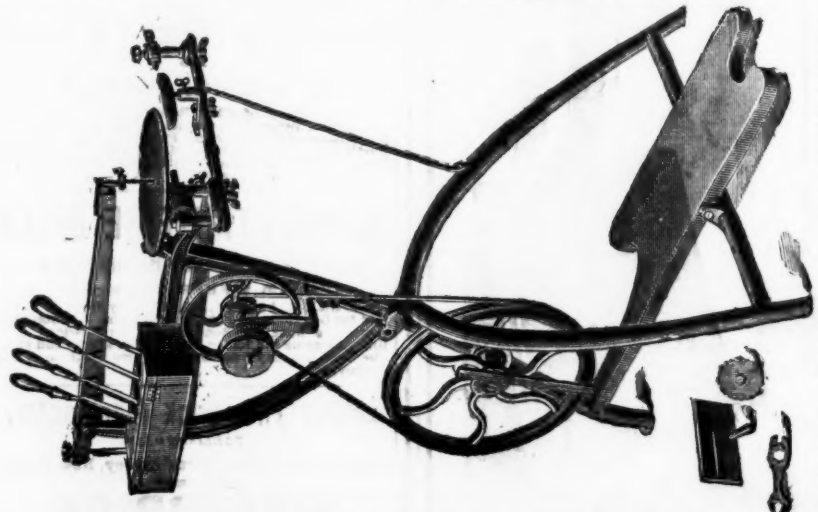
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It is handsomely painted red and green, with red stripes, and presents a beautiful appearance. Those parts which are not painted are either polished or japanned. We warrant the Saw to be just as herein stated, and we know it will give entire satisfaction, being a more expensive machine than those which we formerly sold for \$25. It consists of—
1st.—A SCROLL SAW, with Tilt Table for Inland work; arms 18 inches in the clear; clamps which will hold saws of any length or width, and face them in four different directions; cutting lumber from 1/8 inch to 1 inch in thickness; speed, 1000 strokes per minute.
2d.—A CIRCULAR SAW, 2 1/2 inches in diameter, which will cut lumber one-half inch and less; with an iron table, 4 by 5 inches.
3d.—A DRILLING ATTACHMENT, with six Stubbs' Steel Drills, of various sizes, for wood or iron work.
4th.—An EMERY WHEEL, with wide and narrow rim.
5th.—A TURNING LATHE, with iron ways and rest, steel centres, and three best steel turning tools; length of ways, 15 inches; distance between centres, 6 inches; swing, 3 inches; length of slide-rest, 4 1/4 inches; number of revolutions per minute, 700.
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PRICE FOR EVERYTHING ABOVE NAMED, \$8.00.
The same, without the Lathe and Circular Saw, \$5.00.
When desired, we furnish with the Lathe a very nice Drill Chuck, for working metal, and a Tail Stock, with a screw centre, for \$2 extra. The machine alone weighs 47 lbs., and, with the box, 70 lbs.
We also keep a full stock of Tools and Supplies in the Bracket-Saving line.

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Manufacturers of DAMAN STANDARD HOLLOW AUGERS.—Universally acknowledged superior to any other in the market. They have recently been improved, making them, as now offered to the trade, the most perfect tools of their kind, either in design, material or workmanship. BROKE AND DOWEL TIMBERS.—The very best as well as the cheapest. METALLIC COMBINATION FLOW PLANK.—Made of solid cast steel and of gun metal. Of an entirely new design. Can be used as Groover, Dado and Rabbet Plane, in any direction of the grain, and also as a Hatch Plane. COMMON SENSE DOOR SPRING.—The most durable and cheapest Door Spring yet made. LEAD PIPE CUTTERS.—To cut lead pipe in any position and without chips or burrs. Please send for circulars and prices.

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UNION,
PREMIUM,
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WHITE MOUNTAIN,
INDIAN POND (red end)
stones gotten up or labeled in any style desired. Price and quality guaranteed.
Our Stones are of good keen grit and will not glaze.



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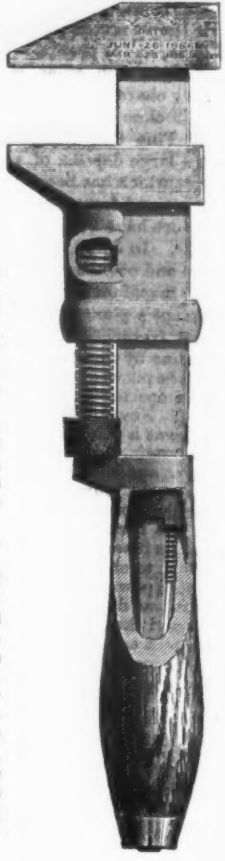
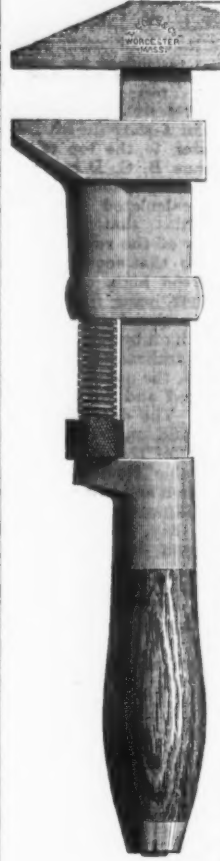
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Manufactured by

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These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes, which were at once closely imitated and sold as the Genuine Wrench by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped.

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Our Standard Springs, weighing about half as much as the Springs of other makers, to do the same work cost but little more per vehicle than a common Spring. Our Jamb-screw, Collingie Collar, Parallel Arm, Malleable Iron Box Axles are the best in the world. Exclusive makers of
LEWIS' TORSION AND CROSS SPRINGS.
Supercedes the Brewster Cross and End, dispenses with side spars, weigh less, hangbody equally low, ride easier and cost less. Shop newly stocked with new and improved Machinery. Send for Price Lists. W. H. WILSON Pres. and Treas. O. P. LEWIS (formerly of Spring Perch Co.), Sec. & Supt.



Notes upon the Drainage of a Flooded Ore Pit at Pine Grove Furnace, Pa.*

BY JOHN BIRKINBINE, C. E.

In a former paper attention was directed to the various forms of pumping machines employed for permanent work in mining and metallurgical processes. The following is simply a collection of memoranda of work done, and is presented as an index for comparison with other work of similar temporary character.

In close proximity to the charcoal furnace at Pine Grove, Cumberland county, Pa., is a large deposit of superior hematite iron ore, which has been worked for a number of years and from which many thousand tons of ore have been taken by open pit workings. In July, 1874, the furnace was blown out and operations at the bank suspended, the machinery for draining being removed, except a plunger pump 18 inches in diameter and 66 inches stroke, operated by a steam engine by means of rods.

The pit was allowed to fill with water, and no steps toward its reclamation were taken until November, 1877. At that time the pit was a pond of water at the base of the mountain, having an area of about four acres and a depth of 70 feet.

As the pump, rods, &c., had been submerged for over 3 years and partially buried by the mud washed down from the banks, and as it was determined for future operations to change the location and propel by water power, a temporary pumping apparatus was determined upon for reclaiming the pit and keeping it drained until the permanent arrangements could be completed.

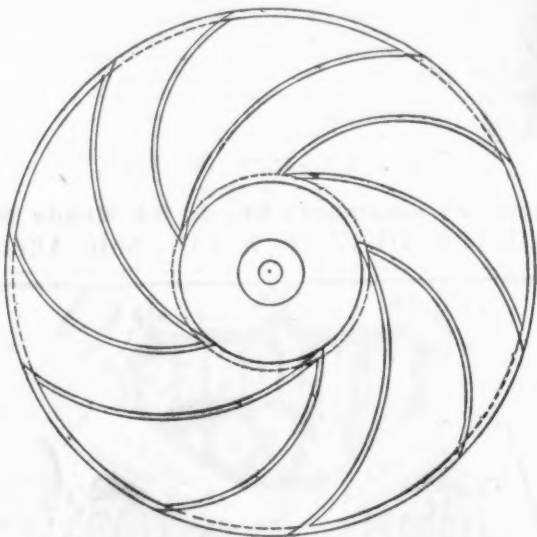
By opening an old adit about 10 feet of the water was removed and the area de-

A.	B.	C.	D.	E.	F.	G.
Lift in feet.	Press. in lbs. per sq. in.	Coal consumed in 24 hours.	Act'l. revolut'ns per minute.	Theoretical revolut'ns per minute.	Gall'ns water discharged per minute.	Duty in million ft. lbs.
15	55	5,100	400	450	1,300	4.73
25	60	4,500	300	350	1,300	8.
35	65	3,200	225	250	1,300	9.7
45	70	2,100	150	175	1,300	13.76
55	75	1,400	100	125	1,100	14.8
65	80	1,100	75	90	1,000	15.3
Average.....						10.

NOTE.—A speed of 400 revolutions per minute gives a velocity at the periphery of the wheel or piston of the pump of 2500 feet; 375 revolutions, 3000 feet; and 730 revolutions, 4000 feet per minute.

The figures in column A show the lift from the surface of the water to the top of discharge hose. Columns B, C, D and F an average. Column E is the speed which the pump should attain, calculated upon the velocity of falling bodies; that is, the velocity of the periphery of the rotary piston should be equivalent to that acquired by a body falling $1\frac{1}{2}$ times the height of lift, the allowance of 50 per cent. being for friction, &c. Column G shows the duty in million pounds raised one foot high by the consumption of 100 pounds of anthracite pea coal, without any allowances, the quantity of coal consumed, water pumped and height of lift being only considered. The decrease in the coal consumed at 15 and 25 feet lift was owing to the protection of the steam pipe. As there was considerable condensation in the long steam connection and leakage in the canvas hose, a fair allowance would place the average duty at, say, 15 million foot pounds and the maximum duty between 20 and 25 millions.

By comparing columns D, E and G, it will be noticed that as the actual speed varied from the theoretical speed the duty increased; this may partially be explained by assuming that the allowance of 50 per cent. as above is excessive, but it is undoubtedly



creased to three acres. The inflow of springs was found to be 250 gallons per minute, and the amount of water contained in the pit was computed to be 45,000,000 gallons. As the inflow would undoubtedly increase while the water sank in the pit, provision was made for removing at least 60,000,000 gallons at the rate of 1,500,000 to 2,000,000 gallons per day.

The company determined to employ a Heald & Cisco centrifugal pump, driven by an oscillating engine by means of a belt. Steam was supplied by four plain cylinder boilers, each 36 inches diameter and 36 feet long, and was conveyed to the engine through from 125 to 200 feet of $2\frac{1}{2}$ -inch tubing, and 50 feet of $2\frac{1}{2}$ -inch steam hose. The discharged water from the pump was conveyed to the surface of the ground by a 7-inch canvas hose from 90 to 125 feet long, emptying into a pool provided with a weir. An account of coal consumed each 12 hours, speed of pump, height of water on weir, pressure of steam at boilers and inches of water removed was carefully kept.

The work of draining the mine was commenced Nov. 28, 1877, and bottom was reached Jan. 1, 1878, a period of 46½ days. Of this time five Sundays should be deducted, as the pump was not run on the Sabbath until the inflow was so increased as to cause serious detention. There were also 86 hours lost by stoppages to make connections, repair hose, &c. The actual working time of the pump was 37½ days, during which 62,000,000 gallons were discharged. The stoppages were caused entirely by adding additional lengths to steam pipe and discharge hose and by repairs to the latter, which was rapidly destroyed by the grit in the water. Seven per cent. of the running time was lost by these stoppages. The machinery consisted of an oscillating steam engine, stroke 16 inches, driving a band-wheel 6 feet in diameter; a centrifugal pump, having a revolving piston secured upon a horizontal shaft, upon which was placed a 15-inch pulley.

The pump piston was 24 inches in diameter, had five hollow arms, each having openings of 8 inches in the central chamber and other openings $2\frac{1}{4} \times 2\frac{1}{4}$ inches at the periphery. [The accompanying diagram, drawn to a scale of $1\frac{1}{2}$ inch to the foot, shows a section of the piston.] The action of the pump was to draw the water through a short suction pipe 7 inches in diameter, into the central chamber and project it from the outward end of the curved arms into the shell of the pump, and thence through a 6-inch discharge pipe to the canvas hose mentioned.

The engine and pump, with band-wheel, belt, &c., weighed 6000 pounds and were placed upon a raft so as to follow the water as it sank in the pit.

The following table is a résumé of data collected and average, and exhibits the operation of the pump under various circumstances:

* A paper read before the American Institute of Mining Engineers at Philadelphia.

owing to the fact that the leakage at low velocities is comparatively greater than in high velocities; that is, the leakage was not in proportion to the height lifted. Had it been possible to attain greater speed the duty would have undoubtedly been increased. By the time bottom was reached the canvas hose gave so much trouble that it was abandoned and 8-inch wrought-iron tubing substituted. The above memoranda were all taken, however, while the canvas hose was in use.

PHILADELPHIA, 152 South Fourth Street.

American and English Locks.

NEW HAVEN, March 5, 1878.

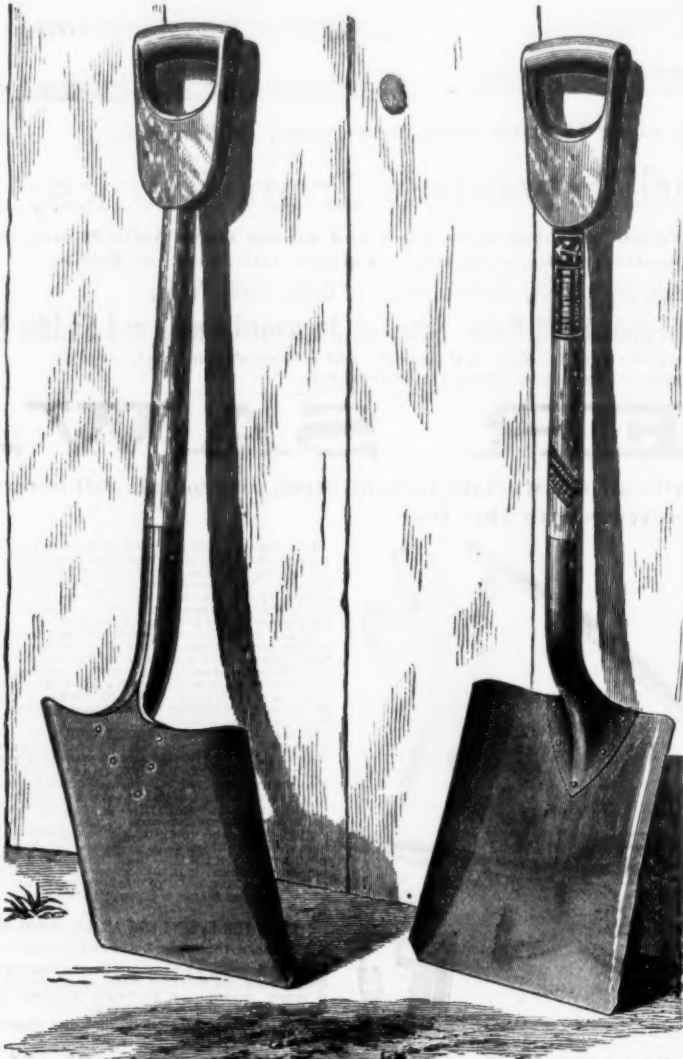
To the Editor of The Iron Age.—DEAR SIR: I read in recent issues of The Iron Age about American and English locks. It is not American machine-made locks that England needs, if any, but foundry made. I know a firm in England that has more machinery for making locks than all the household lock makers in the United States put together. As regards finishing the edges of the lock, if the maker was to take the unfinished goods to a factor he would be told immediately that he could not sell such work except at a lower rate, compared with other makers. Not only this, but selling cheap goods makes slovenly workmen. Workmen have to suffer. They can only sell so many, and the better the goods the better the trade. There is no use in jannanning. In most cases with new houses the fronts are painted over. Do away with polishing the fronts and jannanning and what a nice lot of locks you would see. The locksmith would not only have to make more locks for the same money, but would be compelled to discharge some of their polishers and jannanners. I think those makers who put the best finish on their work have the best trade, whether in England or America.

Seeing Mr. Chubb's name, I must have a word or two about that gentleman. He is one of the best employers in England. He has as good a name as Capt. Thorneycroft. Both have their works in Wolverhampton. Many people ask, "Why don't Chubb get machinery to make his tools?" I believe that if he had done so he would have been shut up long ago. So far from that, I do not think he has been shut down one day in the last 40 years, except on holidays. His locks are all made by hand, most of the men not using even the lathe in drilling. With the breast drill, and using the lathe to countersink with, their locks are as clean inside as outside. You would be surprised to know what a small number they turn out. They have about 60 pair of hands in the Wolverhampton shop, and turn out of all kinds together about 30 dozen a week. I think three mortice locks are counted a fair week's work and about six padlocks and nine chest locks. So you see they are not overworked. They get the same price for their locks that they did 40 years ago. Everything goes nicely, "Come day, go day, God send Sunday." All get their pay every week. I never knew them to fail.

W. B.



B. ROWLAND & CO., PHILADELPHIA.



B. Rowland & Co.'s Patent Riveted Shovel. CAST STEEL.

We would particularly call the attention of the trade to the Patent B. Rowland & Co.'s Anchor Brand Shovel, as now manufactured by us, possessing as it does improvements in construction which render it the most perfect STRAP Shovel made. In it the old style of back strap is entirely dispensed with, and a front strap substituted, riveted and clamped firmly to the blade, clamping the handle in the manner of a ferrule, thus obviating all danger of tearing off strap and making a more beautiful finish front and back. These improvements add to the appearance of the shovel, enhancing its durability at least one-third, and warrant the assertion that all the Shovels we manufacture from this patent will prove the most desirable ever offered the consumer.

The above advantages are also especially noticeable in our Spades and Scoops under the same patent.

B. ROWLAND & CO. CAST STEEL.

All goods of this brand (which is copyrighted) are warranted in every respect, and we will guarantee that the following named PATENT RIVETED Shovels and Spades will be made from the gauge of Cast Steel specified:

D Handle Square Point Shovel	13 gauge
D " Round " "	14 "
Long Handle Round Point Shovel	15 "
D Handle Spades	11 "
D " Western Coal Shovel	15 "
D " Anthracite Coal Shovel	14 "

Gauged by Stubbs' Gauge.

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Scientific and Technical Notes.

Prof. R. H. Thurston, of the Stevens Institute of Technology, in arranging the

HEATING SURFACE OF A STEAM BOILER.
Lays down as the essential rule that the effort be to impede the draft as little as possible, and so to place them that the circulation of water within the boiler be free and rapid at every part reached by the hot gases. The directions of circulation of water on the one side, and of gas on the other side of the sheet should, as much as possible, be opposite. The cold water should enter where the cooled gases leave, and the steam should be taken off furthest from the point. The temperature of chimney gases has thus been reduced by actual experiment to less than 300 deg. Fahr., and an efficiency equal to 0.75 to 0.80 of the theoretical is attainable. The extent of heating surface simply, in all of the best forms of boiler, determines the efficiency, and the disposition of that surface seldom affects it to any great extent. The area of heating surface may also be varied within very wide limits without greatly modifying efficiency. A ratio of 25 to 1 in flue and 30 to 1 in tubular boilers represents the relative area of heating and grate surfaces in the practice of the best-known builders, and this of course furnishes a safe criterion. The material of a boiler, says Prof. Thurston, should be tough and ductile iron, or what is better, a soft steel containing only sufficient carbon to insure melting in the crucible or on the hearth of the melting furnace, and so little that no danger may exist of hardening or cracking under the action of sudden and great changes of temperature. Where iron is used, it is necessary to secure a somewhat hard but homogeneous and uniform quality for the fire-box sheets or any parts exposed to the flames.

Mr. John Bourne, C. E., of Mark Lane, London, has patented a device to prevent

HONEYCOMBING IN CASTINGS.
by which he extracts from the metal while in the molten state the gas or gases by which the honeycombing is produced. The removal of the gases may be effected by the aid of any mechanical means capable of producing rarefaction, such as a common pump, an exhausting jet of steam or other fluid, the hydrostatic gravitation of a column of the molten metal itself, or any other exhausting expedient, by which a vacuum more or less perfect is produced. The molten metal must be exposed to the action of the vacuum in such a manner as to insure the disengagement of the gas from the metal, and for this purpose he submits the metal to the vacuum preferably in a state of minute subdivision. This may be accomplished by allowing the molten metal to run through perforations in a fire-clay block into a tall cylinder, within which a vacuum is maintained. By thus subdividing the metal, and discharging it in the form of a metallic rain into an exhaust chamber, the gases are separated from the metal, and are sucked away by the pump or other extractor in communication with the exhaust chamber. He remarks that it is not intended to subdivide the molten metal (without the aid of a vacuum) for the removal of the gases, nor to attempt to suck away the gases from a vessel filled with molten metal by producing a vacuum above the metal, as the hydrostatic pressure of the metal itself would under such circumstances retain the gases within the metal, notwithstanding the existence of the vacuum above it; but he extracts the gases by the conjoint action of the vacuum and of the subdivision, as above explained, or by analogous or equivalent means embodying the same conditions. As a modification of this process he sometimes melts the metal in a crucible provided with a horizontal division plate, having one or more holes therein, through which holes the metal as it melts flows drop by drop into the bottom part of the crucible. He also makes the crucible with a top or cover, which is luted on, and he conducts a pipe from this cover or other convenient part of the crucible to a pump or extractor, by which a vacuum is maintained within the crucible itself. Each successive thin layer of metal as its melts is thus exposed to the action of the vacuum, whereby the gases are sucked away in much the same manner as when the molten metal is poured through a perforated block, as above described. In either case the gas retaining influence of a column of liquid metal, which produces a hydrostatic pressure within the body of metal itself, is neutralized. The mould for the reception of the molten metal may be placed within the vessel in which the vacuum is maintained when that course is convenient, or the metal may be merely cleared of its gases within the exhausted vessel or chamber, and may be conducted thence while still fluid into moulds exposed to the atmosphere in the usual manner. Should the metal be cooled too much the operation of pumping out the gases to retain the necessary fluidity for casting, it may be reheated previous to casting either in vacuo or in the atmosphere by the aid of a suitable crucible. As water in the act of freezing expels the air with which it was charged, and as this air, if rapidly expelled, makes the ice opaque, by reason of the minute air bubbles entangled in its substance, so metals in the act of solidifying tend to expel their gases, and as their solidification is necessarily rapid, a portion of the gases is imprisoned, and honeycombing is naturally produced. He aids the operation of expulsion of the gases during the cooling of the molten metal, for as the metal cools the gases, besides being expelled, will be pumped away, and cannot, therefore, be re-absorbed.

Protecting a Foreign Trade-Mark.—Felix Prot & Co., of Paris, registered their trade-mark in this country in 1873. They detected last December a quantity of spurious goods in the New York market bearing their trade-mark. The members of the firm of C. M. Rich & Co. were brought before United States Commissioner Osborn on the charge of violating the International Trade-mark Act of 1876. They were held to await the action of the grand jury, and were admitted to \$4000 bail each. This is one of the first cases under the recent Act of Congress protecting international trade-marks.

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A. H. SPENCER,
Solicitor of Patents,And Expert in Patent Cases.
25 State St., Room 19, Boston.

The English Rail Exports.

The London Mining Journal has the following upon the British export of rails:

Although these are undoubtedly dull times, it is not unsatisfactory to note that the external demand for our rails has somewhat improved this year. The exports of our steel rails have especially experienced a rather important expansion, showing that the value of this description of rails is more and more appreciated. Even the United States, in spite of the remarkable development of American metallurgical industry since 1870, and in spite, too, of the severe protective tariff imposed by Congress, have been fain to take our steel rails to the extent of 404 tons this year. Russia has been a large purchaser of our steel rails this year, having taken 71,252 tons to Nov. 30, as compared with 62,458 tons in the corresponding period of 1876. Steel rails are much more calculated to resist the severe climate of Russia than iron rails, and that the Russians have come to this conclusion is evidenced by the fact that for every 17 tons of steel rails which we have sent them this year, they took only 1 ton of iron rails.

The exports have been about the same extent during each of the two years, but the proportion of iron to steel rails exported has sunk from 1 in 5 tons to 1 in 17 tons, and the Russian demand for iron rails would thus appear to be practically disappearing altogether. A somewhat similar result is observable if we institute a similar comparison with regard to the shipment of our rails to British India.

The proportions sustained by the iron and steel rails exported has been completely reversed during the last two years, the exports of iron rails having fallen off some 33 per cent., while those of steel rails have expanded nearly threefold.

It is, however, rather curious to notice that iron rails have more than held their own this year in the Australian colonies, although the consumption of steel rails in those dependencies has at the same time also increased.

Present cheapness would appear to be the great point aimed at in the construction of railways in the Australian colonies; at any rate, iron rails are in more request in that quarter than in any other market. We may fairly question whether it is true and real economy in the construction of railways to aim at cheapness before every other consideration, but we must take the world as we find it, Australia included. It must be borne in mind also, that when rails as they have to be imported by the Australians, at a prodigious distance, they cost a good deal, whether they are classed as iron or steel.

Hitherto we have dealt only in special illustrations based on the experience of some one country; but if we now proceed to sum matters up from a general standpoint, we are forced to the conclusion that iron rails are being more and more superseded by steel rails. Thus in the 11 months ending Nov. 30, this year, iron rails were exported from this country to the aggregate extent of 165,214 tons, as compared with 182,240 tons in the corresponding period of 1876. On the other hand, 217,426 tons of steel rails were exported from this country to Nov. 30, this year, the corresponding exports in the corresponding period of 1876 coming out at the much smaller total of 161,388 tons. The metallurgical interest of Great Britain has been endeavoring to adapt itself to the altered circumstances of the times, and who can say that in doing so it has not been wise in its generation?

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Tiles, Blocks, &c., &c.
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To Lift.	To Raise.	Price.	Ex. Ft.
8 ft.	500 lb.	\$22 50	\$1 00
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8 "	2,000 "	30 00	1 50
8 "	3,000 "	40 00	2 00
8 "	4,000 "	50 00	2 20
8 "	5,000 "	60 00	2 40
8 "	6,000 "	75 00	2 60
8 "	8,000 "	95 00	3 00
8 "	12,000 "	150 00	3 75
8 "	15,000 "	225 00	4 75
8 "	20,000 "	350 00	6 00

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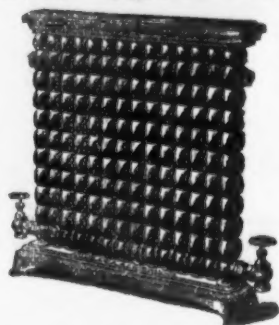
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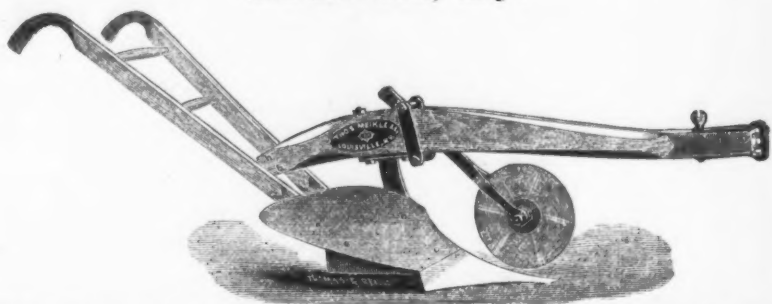
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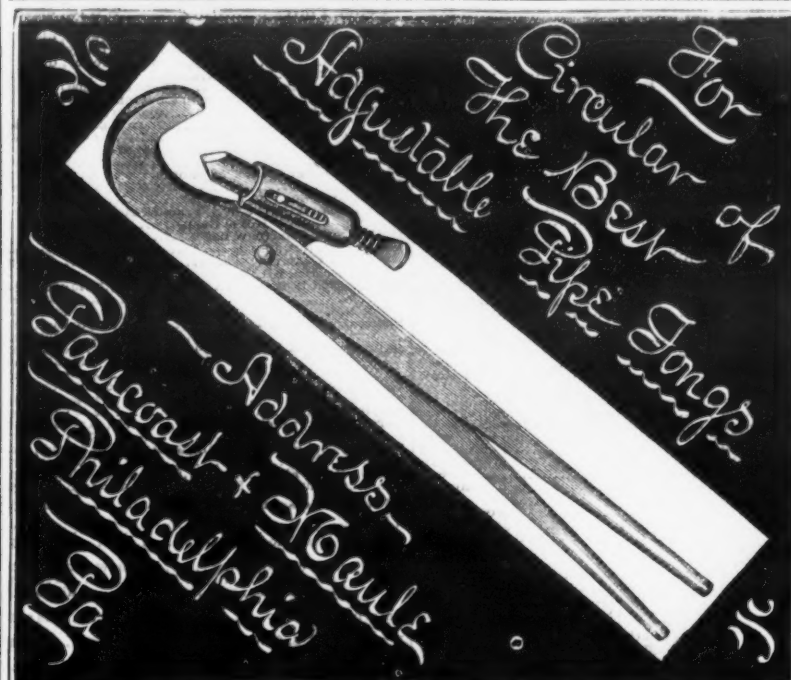
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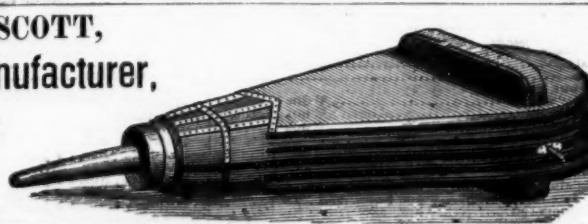
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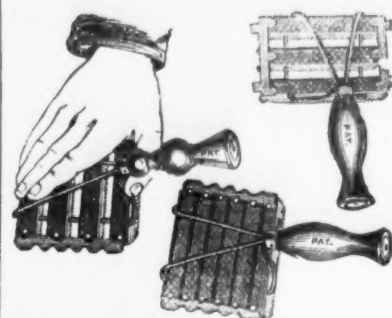
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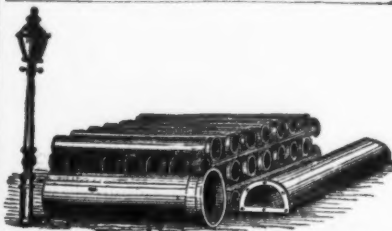
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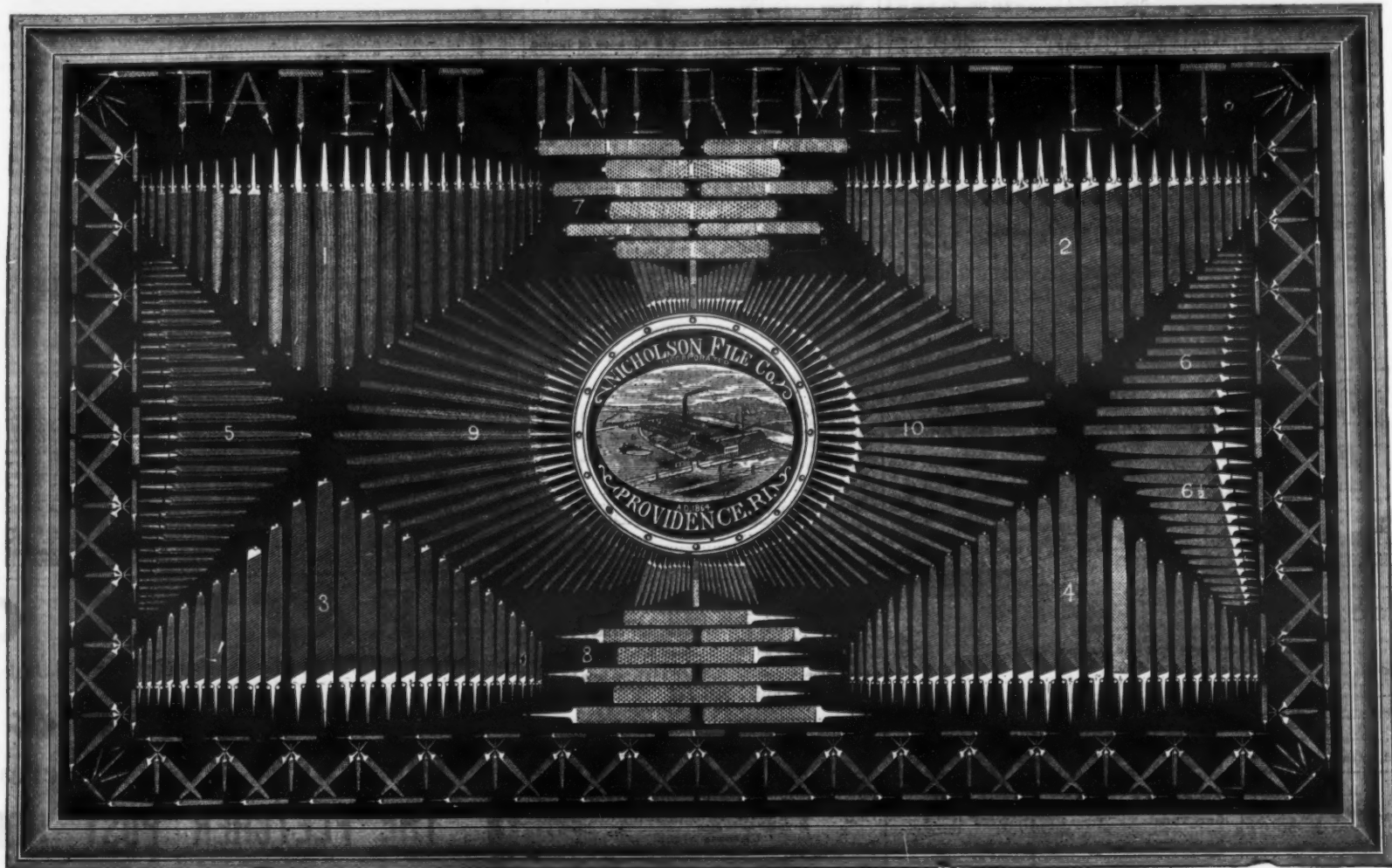
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2.—Hand.

3.—Mill.
4.—Flat.

5.—Triangular.
6.—Pillar.

6½.—Knife.
7.—Plain Rasps.

8.—Tanged Rasps.
9.—Round.

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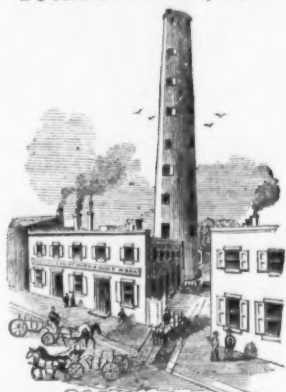
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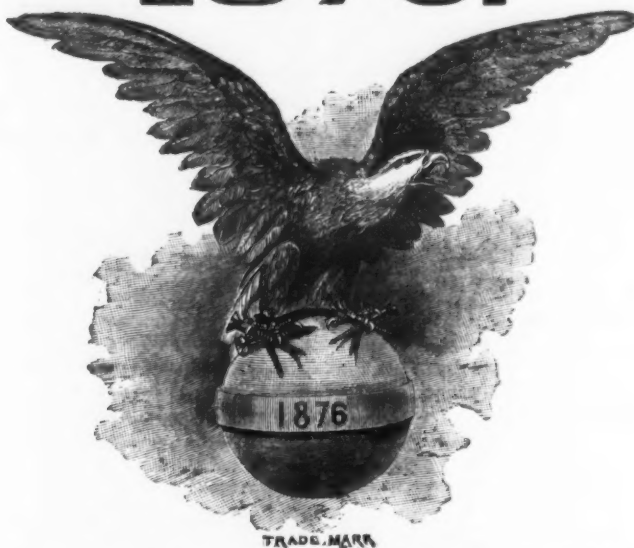
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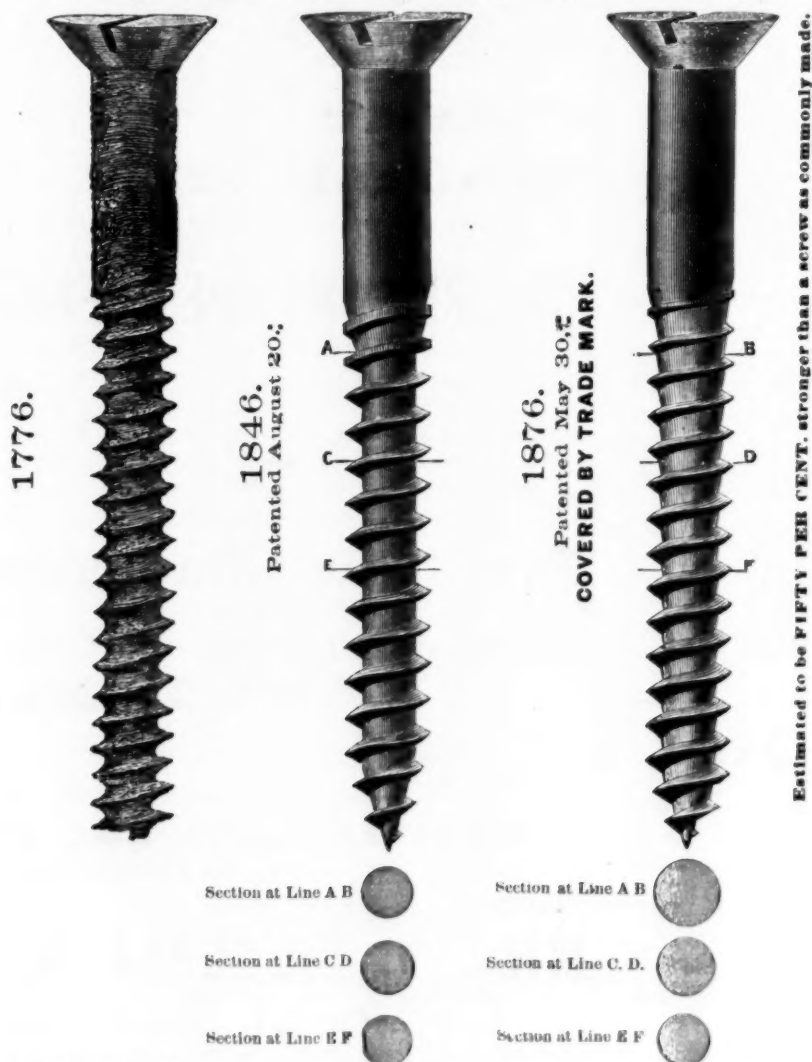
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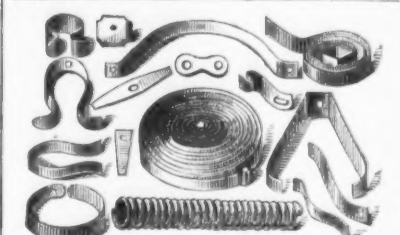


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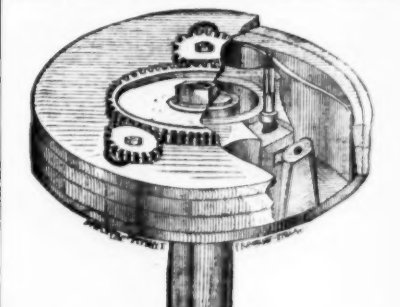
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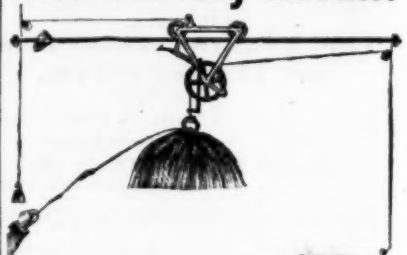
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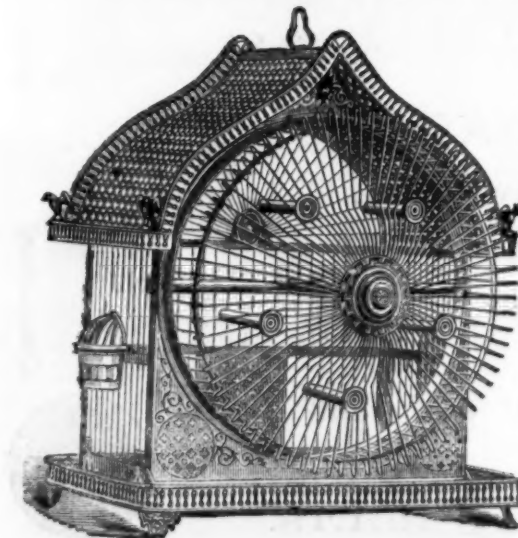
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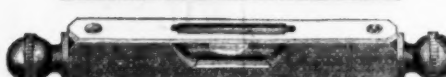
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LET and HORSE WASPS,
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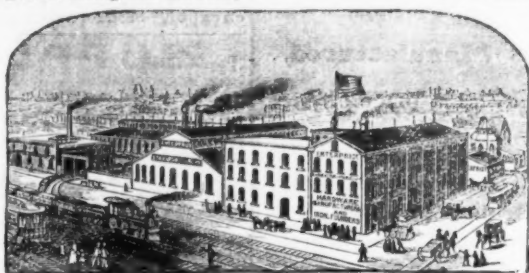
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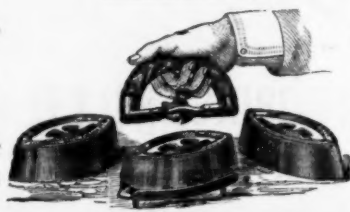
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The American Lock Mfg. Co.,Are the most **SECURE** and **DURABLE** ever made.**SECURE**

Because they have 40 Brass Tumblers, independent in their action, either one of which will prevent the lock from being opened unless brought to proper position by the Key.

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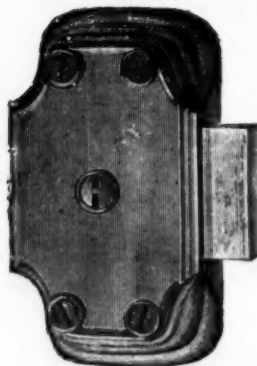
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STERLING METAL KEYS

That will not corrode or wear, and are stronger than steel.



FULL SIZE OF KEY.



Upright Rim Dead Locks,
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Fronts and Knobs,
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Solid Bronze Padlocks.

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Our goods have been very much improved recently, by making the Bar WRENCH, as shown in the cut, which makes a 12 in. Wrench as strong as a 15 in. made in the ordinary way, and by using

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NEW PATENT

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Which cannot be forced back into the handle.

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Hawking Beetles, Hawking and Calking Irons also all kinds of Handles, Sledge, Chisel and Hammer Handles. Also

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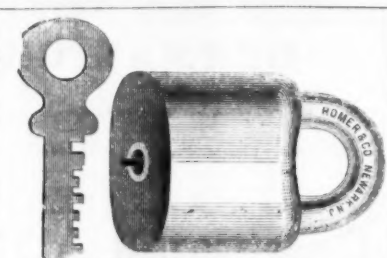
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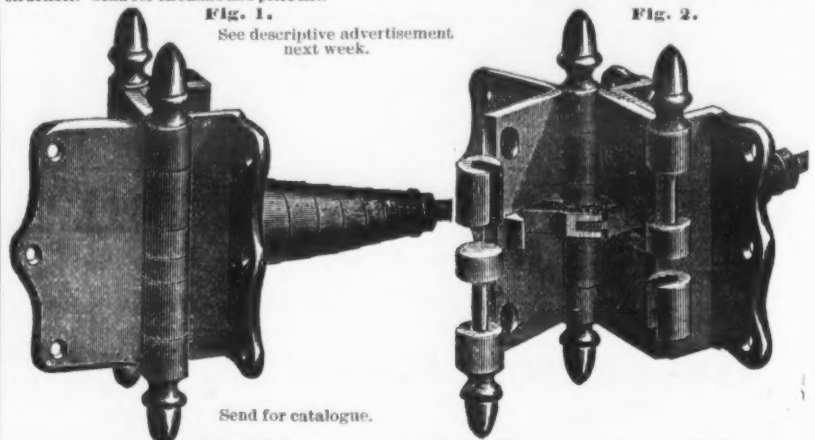
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The most efficient and simple Door Spring ever made. Will readily close the heaviest outside doors, as they get the maximum pressure upon the door when closed, and a constantly decreasing pressure as the door is opened. The tension of the spring is readily adjusted to any power required, and there is no attachment of any kind to the door. Are specially adapted for railroad depots, offices, stores and public buildings, as they can instantly be made inoperative if desired, without detaching any part of it. No chains or straps to break or wear out. We use a long coiled spring made of the best cast steel, and tempered, and are practically indestructible. Send for circulars and price list.

Fig. 1.

See descriptive advertisement next week.

Fig. 2.



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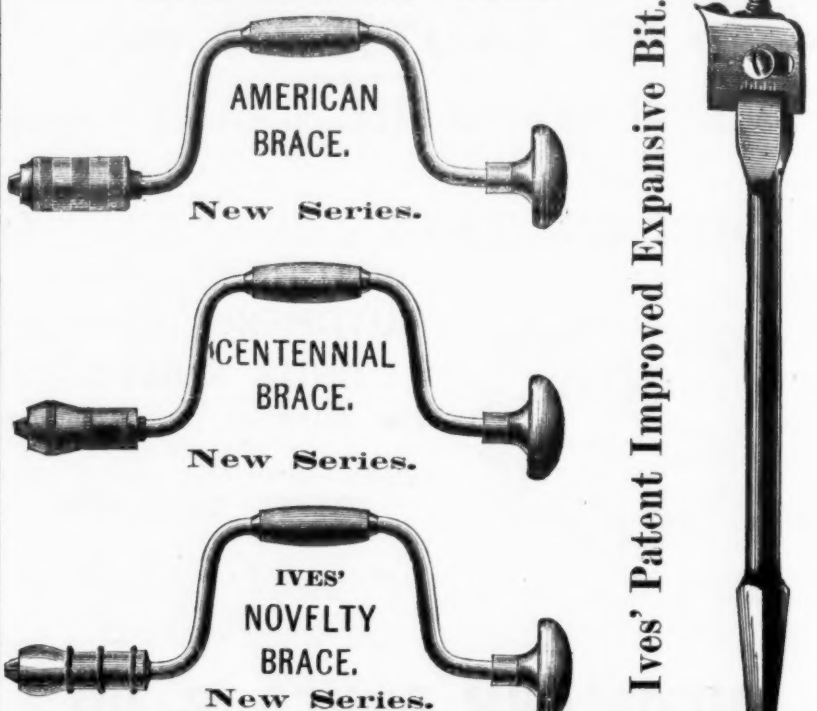
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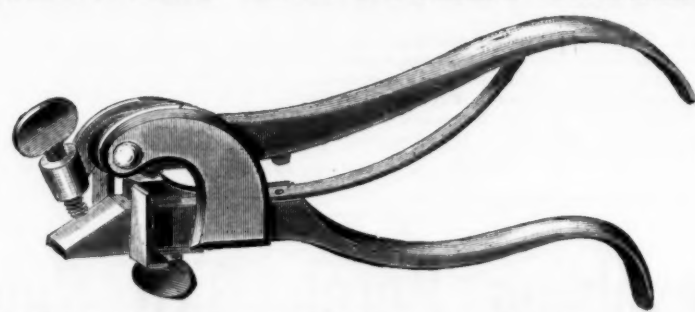
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The internal arrangement of these Braces has been so changed as to avoid any foundation for a claim of infringement. Manufactured under our own patents, they are stronger, more simple, and cannot get out of order. We guarantee the goods and those who buy them. Numbers same as in our Catalogue.

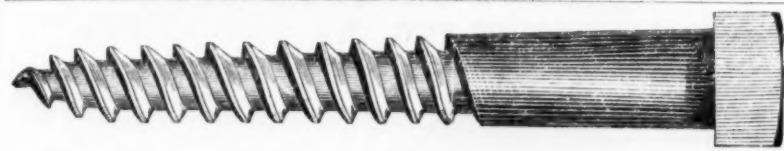
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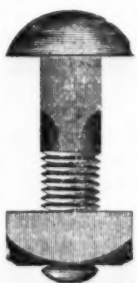
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Washers, all made from new band iron..3c p 5 off net

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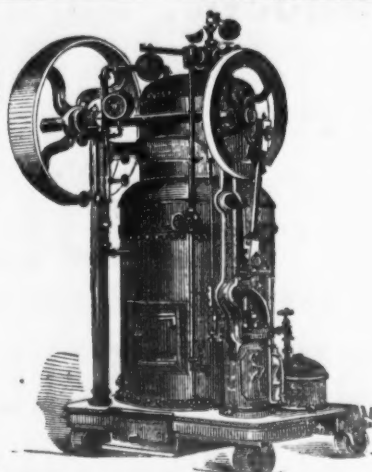
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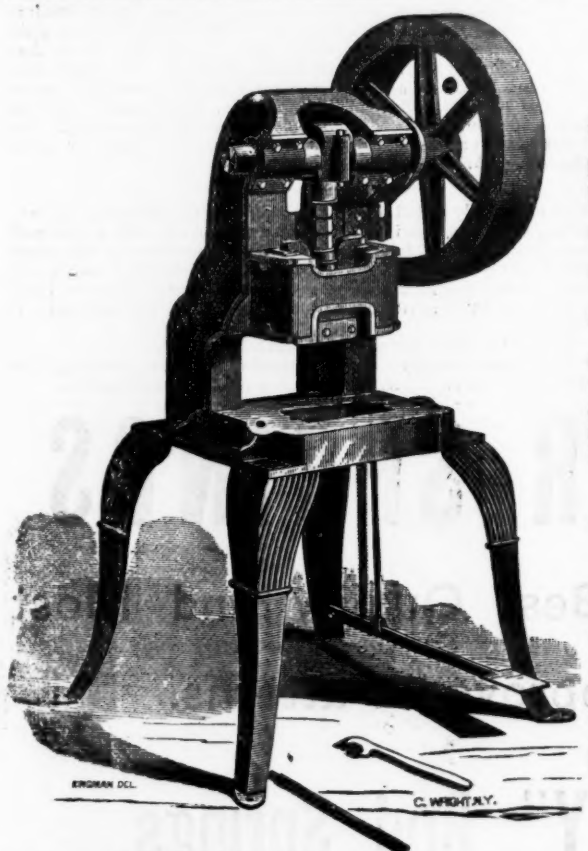


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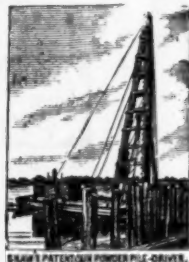
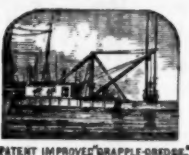
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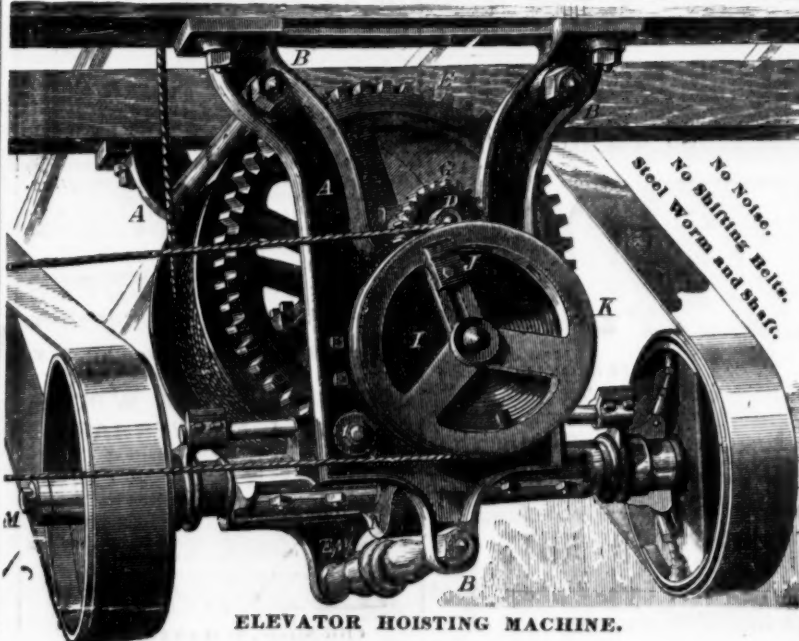
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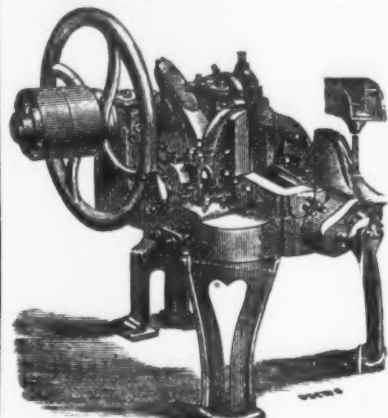
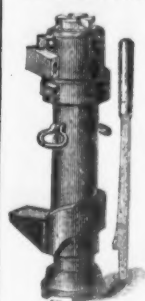
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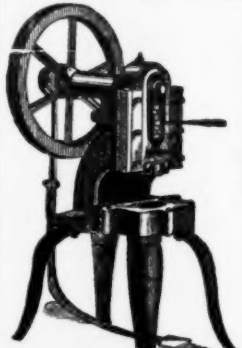
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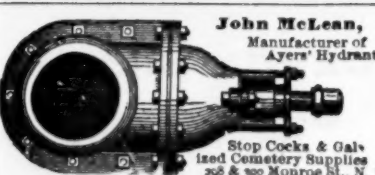
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EUREKA SAFETY POWER!
Practically impossible to
explode. Tested to 300 lb
pressure per square inch. Will
burn 2 inch seasoned oak-grain
bushels per hour. Price,
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W. B. PAYNE & SONS,
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MEDAL and PREMIUM
Awarded to
T. C. ALCOTT & SON,
Mount Holly, N. J.
For their Improved
Turbine Water Wheels.



The Eureka Steam & Hydraulic Packing.

SYMONDS & CO., 120 Exchange Place, Phila.,
Sole Manufacturers.



The results of a long series of experiments made
with a view of meeting all the requirements of a Per-
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that it is the best article of its kind yet invented.
It is made of the best materials, is elastic, pliable, and
does not become hard by use, consequently is easily
taken out when renewal is necessary. It has a rubber
center, rectangular in form, covered with a series of
braids of linen, between which is placed a lubricative
compound superior to anything ever before used for
the purpose, and contains nothing that can in any
manner cut, flake or gum the rods, no matter how
long run. It has thus far received the highest praise
of every engineer who has used it, and we have re-
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Mills, Factories, Iron Works, &c., that it is the most
durable, efficient and cheapest packing they ever
used. All we ask is a fair trial, knowing it will con-
vince better than any words of ours. Orders prompt-
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INTERNATIONAL EXHIBITION CO., CENTENNIAL GROUNDS,
PHILADELPHIA, August 16th, 1877.

This is to certify that I have used the Eureka Steam Packing on the piston and valve rods of the
Buckeye Engines furnishing power for the machinery at the Permanent Exhibition, and I take plea-
sure in saying that it is an A-1 Packing. I pay scarcely any attention to the stuffing boxes since using
it, and they are always tight. The effect on the rods is to make them smooth and bright, and keep
them so.

NEWARK, N. J., September 5th, 1877.

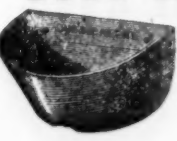
Messrs. Wickersham & Co., Philadelphia, Pa.—GENTLEMEN: We have used your Eureka Packing
on the piston rod of our engine for the past six months, and it is still running and giving entire satis-
faction. Yours, truly,
S. G. STURGES, SON & CO.

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Messrs. Wickersham & Co.—GENTS: We have used your Eureka Packing and find it just as you
represent it, both in economy and durability. It does not gum or cut the rods, and in every way is a
perfect packing. Yours, truly,
WILSON BROTHERS.

WICKERSHAM & CO., Sole Agents, 59 South Fourth St., Philadelphia.

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XXX Gennise...	85c	C.....	17c
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*Note.—The above are my standard mixtures, and have given satisfaction wherever used, but I am prepared to make Anti-Friction Metal of any quality or mixture desired by the purchaser.

INGOT BRASS. | OLD METALS AND TURNINGS WANTED. | BRASS CASTINGS.

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Swedish Tire, Toe, Blister and Spring Steel.

**CAST SPRING AND PLOW STEEL.
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OXFORD TOE, SLEIGH, TIRE AND SPRING STEEL.

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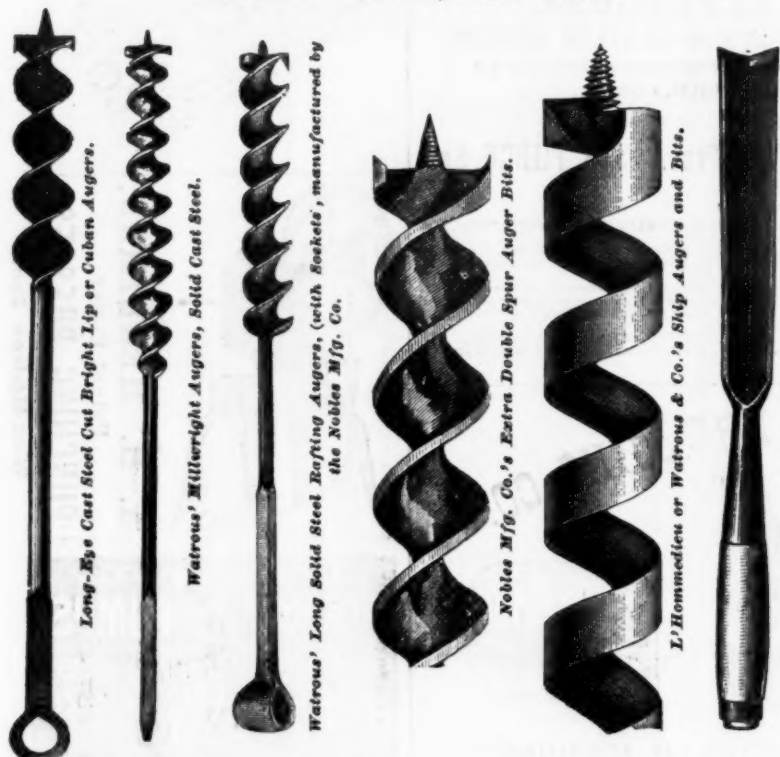
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Solid and Homogeneous. An invaluable substitute for metal, solid and homogeneous. All work guaranteed. Send for circular.

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Light and heavy Steel Castings of superior metal, solid and homogeneous. All work guaranteed. Send for circular.

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Guaranteed.

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FRICTION CLUTCHES

For connecting Shafting and Gearing.

Holding Machinery & Elevators, Shafting,

Hangers and Gearing.

Lafayette Street, PROVIDENCE, R. I.

See cut of Elevator Holding Machine in issue of Mar. 21, 1876, page 37.

PATTERNS, MODELS

and Experimental Machinery of every description, made by

WM. BURROWS, 90 Fulton St., N. Y.**Scranton Brass Works,**

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Manufacturer of

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Car & Wilcox Patent Cut Files.

Will cut faster, wear longer, and clog less than any file in market.

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Carriage Bolts made from Best Square Iron, a Specialty.

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Manufacturer of all kinds of

First-Class Saws, Saw Frames, Cross-Cut Handles, Tools, Files, &c. Also Sole Proprietor and Manufacturer of the Genuine Patent Lightning Saw.

80 BEEKMAN STREET, NEW YORK.

TRIAL OF THE IMPROVED LIGHTNING SAW.

The Emperor, Dom Pedro, accompanied by Director General Goshorn, Superintendent Albert, and others, visited Machinery Hall, at the Centennial on the evening of June 28th. Among other things inspected, at the invitation of E. M. BOYNTON, of New York, they witnessed a trial of the *New Lightning Saw*, patented March 26, 1876. Two men, with one of these saws, cut off a sound log of gum-wood, one foot extreme diameter, in seven seconds, or at the rate of a cord of wood in five minutes. Messrs. Corliss, Morell, Lynch, and other members of the commission, witnessed the trial and timed the cutting. The Emperor remarked, That was fast, very fast cutting. Last evening the Emperor made another examination of the saw.—*Philadelphia Press*, June 30.

"BOYNTON'S SAWS were effectually tested before the judges at the Philadelphia Fair, July 6th and 7th. An ash log, eleven inches in diameter, was sawed off, with a four-and-a-half-foot lightning cross-cut, by two men, in precisely six seconds as timed by the chairman of the Centennial Judges of Class Fifteen. The speed is unprecedented, and would cut a cord of wood in four minutes. The representatives of Russia, Austria, France, Italy, Spain, Belgium, Sweden, England, and several other countries, were present, and expressed their high appreciation."

Received Medal and Highest Award of Centennial World's Fair, 1876.
\$1000 Challenge was prominently displayed for six months, and the numerous saw manufacturers of the world dared not accept it, or test in a competition so hopeless.

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"TORREY" Rod Springs,**"GRAY" Rod Springs,****"GEM" Coil Springs,****"STAR" Coil Springs.**

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